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Shelter Cove

Final Environmental Impact Statement

Alaska Region Ketchikan Area

Volume I

Final Environmental Impact Statement

Shelter Cove

U.S.D.A. - Forest Service
Alaska Region
Alaska

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Abstract

The Forest Service proposes alternative ways of harvesting between 61.8 and 95.6 million board feet of timber during the next five years in the Shelter Cove area of the Tongass National Forest.

The FEIS describes six alternatives which provide different combinations of resource outputs and spacial locations of harvest units. The alternatives are (1) the No-Action Alternative; (2) to emphasize timber economics by selecting timber stands with the greatest potential for economic return; (3) to emphasize recreation and visual management by dispersing harvest units and making harvest units less visible adjacent to potential recreation opportunities; (4) to emphasize timber volume; (5) to emphasize forest-interior species by maintaining large blocks of timber and limiting road construction in these areas; or (6) to retain the recreation and visual emphases by the dispersion pattern of units while increasing the timber harvest level to improve timber sale economics.

Summary

Purpose and Need (Chapter 1)

A Final Environmental Impact Statement (FEIS) has been prepared to describe alternatives for the harvest of timber in and around the Shelter Cove and George Inlet areas of the Tongass National Forest. The FEIS also discloses the consequences resulting from implementation of these alternatives.

The National Forest Management Act (NFMA) directs each forest to prepare an overall plan of activities. The Tongass Land Management Plan (TLMP), completed in 1979 and amended in 1986, provides general management direction for the Tongass National Forest. This FEIS implements that direction for the project area and supplements guidelines outlined in the Alaska Regional Guide.

The Tongass National Forest, Ketchikan Area Forest Supervisor is responsible for deciding the extent and location for the management of resources in the project area over the next 5 year (1991-1995) planning period.

Public involvement refined preliminary issues and concerns that resulted in identification of the following issues to be addressed in the FEIS:

1. Effects of Timber Harvest on Visual and Recreation Resources
2. Timber Sale Economics
3. Effects of Timber Harvest on Fish Habitat
4. Effects of Timber Harvest on Wildlife Habitat
5. Effects of Timber Harvest on Soil and Water Resources
6. The Protection of Subsistence Use Areas During Timber Harvest

Alternatives (Chapter 2)

The Forest Service developed six alternatives for analysis which have been evaluated in detail. These alternatives respond to the issues and concerns outlined in Chapter 1.

Several alternatives were considered but not evaluated in detail. Those were:

- Single resource or issue.

  It was suggested that timber development be intensified on Revillagigedo Island so that timber harvest could be eliminated on Cleveland Peninsula. This issue was not considered because these types of alternatives would not have met the objectives of planning for a sustained flow of renewable resources, i.e., outdoor recreation, forage, wood, water, wilderness, wildlife, and fish, in a combination that best meets the needs of the community.

- Road link between Ketchikan and the Project Area.

  This issue was not considered because it is felt that a separate environmental document would best address the many complex issues involved.

Alternative 1—No Action

This is the No Action alternative. Under this alternative no new activities would be scheduled during the 1991-95 period in the project area. Current activities such as free use permits, cooperation with state/borough governments and private groups and individuals regarding land ownership concerns, etc., would continue.

This alternative serves as the baseline against which the impacts of all other alternatives will be measured.

Alternative 2—Timber Economic Emphasis

This alternative proposes to harvest 63.9 million board feet of timber in VCUs 746, 747, and 748, representing 2,191 acres over the planning period. All timber would be transferred to the water at a proposed Log Transfer Facility (LTF) at Shelter Cove in Carroll Inlet. New road construction totals 52.1 miles. The average harvest unit size is 49.8 acres.

This alternative emphasizes timber economics. No harvest would be seen from communities, major marine travel routes or developed recreation sites. Timber management activities would have less effect on the old-growth acres available for wildlife habitat than Alternative 4, but more than Alternatives 3, 5, and 6.

This alternative allows for stream buffers on all Class I and II streams. Please refer to Chapter 2 of this document under Aquatic Habitat Management Standards and Guidelines for more information regarding these buffer zones.

Subsistence guidelines as outlined in the Alaska National Interest Lands Conservation Act (ANILCA) Section 802 will be met. For more information on ANILCA Section 802, please refer to Chapter 3 of this document under Subsistence.

Alternative 3—Recreation/Visual Resource Emphasis

This alternative proposes a harvest of 61.8 million board feet of timber in VCUs 746, 747 and 748, representing 2,231 acres over the planning period. All timber would be transferred to the water at a proposed log transfer facility (LTF) at Shelter Cove. New road construction totals 59.1 miles. The average harvest unit size is 43.8 acres.

This alternative emphasizes visual management and the potential for recreation. No logging units are adjacent to potential recreation opportunities and marine travel routes. Timber management activities would have less effect on old-growth acres available for wildlife habitat than Alternatives 2, 4 and 6, but more than Alternative 5.

Alternative 4—Timber Volume Emphasis

This alternative proposes to harvest 95.6 million board feet of timber in VCUs 746, 747 and 753, representing 3,603 acres over the planning period. All timber volume would be transferred to the water at the proposed LTF at Shelter Cove in Carroll Inlet. New road construction totals 80.4 miles. The average harvest unit size is 70.7 acres.

This alternative emphasizes timber volume more than the other alternatives. Timber management activities would have the most effect on old-growth acres available for wildlife habitat than the other alternatives.

This alternative allows for stream buffers on all class 1 and 2 streams.

Subsistence guidelines as outlined in ANILCA Section 802 will be met.

Alternative 5—Emphasis on Forest-Interior Species

This alternative proposes to harvest 67.1 million board feet of timber in VCUs 746, 747, and 753, representing 2,581 acres over the planning period. Volume would be transferred to the water at a proposed LTF at Shelter Cove in Carroll Inlet and using the Cape Fox facility at Hume Island. New road construction totals 60.7 miles. The average harvest unit size is 53.7 acres.

This alternative emphasizes wildlife habitat maintenance of forest-interior species by maintaining large old-growth blocks of timber. Road construction would be located away from VCU 748 to maintain old-growth block habitat. Timber management activities would affect old-growth acres available for wildlife habitat less in this alternative than in the other alternatives.

This alternative allows for stream buffers on all class 1 and class 2 streams.

Subsistence guidelines as outlined in ANILCA Section 802 will be met.

Alternative 6—Recreation/Timber Emphasis

This alternative proposes a harvest of 82.1 million board feet of timber in VCUs 746, 747, 748, and 753, representing 3,060 acres over the planning period. Under this alternative the timber volume would be transferred to the water at Shelter Cove, and using Cape Fox's facilities at Hume Island. New road construction totals 71.0 miles. The average harvest unit size is 51.9 acres.

This alternative emphasizes retaining the recreation and visual values by the dispersion pattern of units while increasing the timber harvest level to improve timber sale economics. Timber management activities would have less effect on old-growth acres available for wildlife habitat than Alternatives 2 and 4, but more than 3 and 5.

This alternative allows for stream buffers on all class 1 and 2 streams.

Subsistence guidelines as outlined in ANILCA Section 802 will be met.

Affected Environment (Chapter 3)

Soils/Water

The development of both mineral and organic soils in southeast Alaska is influenced by wet and cool maritime climatic patterns, rugged topography, diverse geomorphic parent materials, dense coniferous forests, and time. A level three inventory describing soil types and their interpretations to management has been completed on the project area. Soils within the project area have been broken into three general groups: (1) mineral soils; (2) organic soils (Histisols); and (3) mineral or organic soils underlain by glacial till.

Mineral soils occupy approximately 60 percent and organic soils occupy approximately 40 percent of the project area. Soils underlain by glacial till comprise approximately 2 percent of the project area.

One major soil factor of importance to management is slope stability. Slope stability is determined by soil strength, slope gradients, ground water accumulation and vegetative characteristics. Removing vegetation on potentially unstable slopes can greatly increase chances of landslides. "Mass Movement Index" is used to describe the soils in terms of relative stability. Approximately 27 percent of the project area contains soils having high mass movement index and approximately 5 percent of the project area contains very high mass movement index soils. Organic soils possess a low mass movement index. Approximately 68 percent of the project area contains soils having moderate and low mass movement index. Mass movement frequency data is not available. Table S-1 summarizes total acres of soils data by VCU for the Shelter Cove project area.

Table S-1
Soil Inventory by VCU by Acre

VCU	High Hazard	Very High Hazard	Forest Wetland	Muskeg	Non-wetland	Estuary	Till	Mineral	Organic
746	1,521	773	3,261	525	3,125	3	0	4,107	2,851
747	11,612	2,181	15,253	9,636	21,946	0	1,115	26,829	20,850
7478	1,746	225	1,284	213	2,614	0	65	3,212	799
753	1,232	0	1,201	37	1,283	0	0	2,153	247
Total	16,211	3,179	20,999	10,411	28,968	3	1,180	36,301	24,747
% Area	27%	5%	35%	17%	48%	<1%	2%	60%	40%

Wetlands, Floodplains and Riparian Areas

To avoid to the extent possible the long and short-term adverse impacts associated with destruction or modification of wetlands and floodplains, respectively, the Corp of Engineers Wetlands Delineation Manual provides standards for determining areas of wetlands. Land areas are determined to be wetlands when wetland diagnostic characteristics are present for all three parameters of soil, hydrology and vegetation. Floodplains are usually built of sediments carried by the stream or river and deposited in the slack water of channels during periods of high water. Floodplains consistently influenced by tidal action are estuaries. Within the project area, wetlands comprise approximately 52 percent and estuaries comprise less than 1 percent of the landscape.

Riparian areas were delineated in the project area (and are available for review at the Ketchikan Ranger District) to conserve soil and water resources and to preclude impairment of the productivity of the land. For this document, riparian areas are considered to coincide with Aquatic Habitat Management Units (AHMUs).

Visual Resource

The majority of the landscape in the project area can be described as having a Preservation existing visual condition. This is because very little of the area has been entered for development in the past. The areas that are not classified in this category have been altered either by the Swan Lake transmission line or by previous logging activities along Carroll Inlet. The major landscapes are described as follows:

1. Lands along the west shore of Carroll Inlet are classified as either Partial Retention, Modification or Maximum Modification.
2. Lands surrounding Salt Lagoon and west of the lagoon are classified as Modification.
3. Lands encompassing the transmission line right-of-way east of Salt Lagoon are classified Maximum modification.
4. Lands within the project area that are Native lands and have been harvested are classified as either Modification or Maximum Modification. (These are not reflected in the inventory.)

Table S-2 summarizes the acres in each existing visual condition. These data include information for the entire project area excluding private and state owned land.

Table S-2
Acres in Each Existing Visual Condition

Classification Type	Condition in Acres
Preservation	52,765
Retention	1,518
Partial Retention	1,351
Modification	918
Maximum Modification	3,832

Key viewsheds for the project area are as follows:

1. The area surrounding and including Salt Lake and Salt Creek.
2. The area surrounding North Saddle Lake(s).
3. The west shoreline of Carroll Inlet constituting the foreground and middle ground. This viewshed included the area surrounding Shelter Cove.
4. The southwest facing ridge west of Salt Lake that can be seen from the upper Naha River area.

5. The ridge running north to south just north of Leask Cove.
6. The road corridor proposed in each alternative that leads from Upper George Inlet to Shelter Cove. This key viewshed would exist in the project area if any alternative, other than Alternative 1, is implemented. This viewshed does not exist currently.

Viewsheds numbered 1, 2, 4, 5, and 6 generally consist of unharvested viewsheds and have no other visual disturbance presently associated with them. However, the transmission line crosses just west of Shelter Cove. Viewshed number 3 has been moderately altered with some harvest activity.

Recreation

The project area offers recreation opportunities that are found traditionally in southeast Alaska. These opportunities include: picnicking, camping, hunting, salt and freshwater fishing, hiking, boating, nature study and assorted other activities. The opportunities available are based on no recreation development in the area. However, different landscapes and levels of development can provide settings which support different types of recreation activities. Supplying these settings, therefore, makes recreation opportunities available.

The recreation resources were inventoried using the Recreation Opportunity Spectrum (ROS). The ROS defines and inventories outdoor recreation environments and experience opportunities of a geographic area under the assumption that quality outdoor recreation is assured through the provision of a diverse set or spectrum of opportunities. Opportunities as defined in ROS range from Primitive in which opportunities of isolation, risk and self reliance are high, to Urban in which group activities and competitive sports are prevalent with no opportunity for isolation, risk or self reliance. An in-depth description of ROS can be found in the Region 10 ROS Handbook.

Table S–3 shows the existing acres in each of the individual ROS classes.

Table S–3
Existing ROS Acres

ROS Classes	Acres
Primitive I	4,662
Primitive II	696
Semi-Primitive Non-Motorized	36,217
Semi-Primitive Motorized	2,200
Roaded Natural	1,626
Roaded Modified	14,977
Rural	0
Urban	0

The key recreation areas concentrated on in this document are listed below. Figure 3–7 in the Maps document indicates their location.

1. The Naha River area, which includes Heckman and Patching lakes, is outside the project area.
2. Salt Lagoon, at the head of George Inlet.
3. North Saddle lakes.
4. South Saddle Lakes.
5. Salt Lake and Salt Creek, both draining into Salt Lagoon.
6. Shelter Cove.

Cultural Resources

Cultural resources include all evidence of past human-related activity, dating from the earliest beginnings to the fairly recent past. Historically, the project area contains remains of shipwrecks, mines, homesteads, fishing, trapping, and other subsistence activities. Ethnohistorically, the area was occupied by as many as three distinct Tlingit groups. And prehistorically, it is likely that Revillagigedo Island has been utilized continuously for at least the past 5000 years. Prehistoric and ethnohistoric sites are revealed by shell middens, abandoned villages and camps, fish traps and petroglyphs.

The cultural heritage of the Shelter Cove study area is rich and varied. This ranges from elevated fossil beaches which may contain clues of the earliest occupation of southeast Alaska and of population of the New World to Tlingit settlement and use. Legislation and policies have been enacted which ensure the protection of significant cultural resources from the impact of individuals or project activities.

Transportation

The transportation system on Revillagigedo Island is made up of many isolated systems located around the island. The largest system is in the city of Ketchikan, referred to as the greater Ketchikan road system. This system is made up of roads that predominantly fall under the jurisdiction of State or local governments. Only a few miles of Federal roads lie within the greater Ketchikan road system. The roads under the jurisdiction of the Forest Service consist of many small isolated systems scattered around the island, and are used mainly for timber harvest activities. The public does not generally have access to these systems, unless it is by foot, boat or float plane.

The transportation system considered in this document lies in a project area approximately 15 miles northeast of Ketchikan. This system consists of categories: (1) State and municipal roads; (2) private roads; (3) Forest Development Roads; and (4) log transfer facilities. Of the State and municipal roads, only about a half mile falls within the project boundary and would not connect to the proposed system. Of the private roads located in the project boundaries, 4 miles will be considered for use in the proposed alternatives. Less than 5% of the 175 miles of existing Forest Development Roads on Revillagigedo Island are in the project area, and will not connect to the proposed road system. This proposed system will not connect to the greater Ketchikan road system. The project area contains three existing active log transfer facilities. All of these are privately owned. Up to two more log transfer facilities are proposed for construction in the project area to meet this plan's objectives.

Timber Resources

The 60,383 acres of Federal land within the project area which have not been withdrawn by State or administrative action are composed of approximately 50 percent commercial forest and 50 percent non-commercial forest land. Most of the forest in the project area is old growth, averaging 120 to 140 feet in height. The forest extends from sea level to an altitude of about 2,000 feet. Western hemlock and Sitka spruce account for about 92 percent of the commercial forest. The remaining 8 percent is western redcedar and Alaska-cedar. Non-commercial species in the area include red alder and shore pine.

Land suitable for the production of timber is classified in terms of volume per acre. The volume class (VC) breakdown for the project area is as follows:

VC 4	8 to 20 thousand board feet/acre
VC 5	20 to 30 thousand board feet/acre
VC 6	30 to 50 thousand board feet/acre
VC 7	50 + thousand board feet/acre

Tables S–4 and S–5 display the breakdown by volume class for the project area.

Table S-4
Acres of Old-Growth CFL by Volume Class

VCU	Volume Class 4	Volume Class 5	Volume Class 6	Volume Class 7	Total Acres by Volume Class
746	3,649	4,431	336	0	8,416
747	3,745	5,194	731	114	9,784
748	3,145	3,265	158	265	6,833
753	2,703	1,636	0	0	4,339
Total	13,242	14,526	1,225	379	29,372

Table S-5
Volume in MBF of Old-Growth CFL by Volume Class

VCU	Volume Class 4	Volume Class 5	Volume Class 6	Volume Class 7	Total Acres by Volume Class
746	66,526	132,748	11,700	0	210,974
747	70,187	155,606	25,434	5,723	256,950
748	56,366	97,802	5,492	13,236	172,896
753	51,686	48,999	0	0	100,685
Total	244,765	435,155	42,626	18,959	741,505

Within the project area approximately 1,373 acres have been harvested. Initial entry began around 1960 and has been confined to beach areas along Carroll and George Inlets. The last entry was 1978.

The existing timber industry of southeast Alaska consists of five sawmills and two pulp mills. The two pulp mills produce dissolving pulp for both domestic and export markets. The five sawmills produce cants and dimension lumber for export. In addition, unprocessed logs have been exported from southeast Alaska by the Native Corporations in the region.

Fish Resources

The waters of the Shelter Cove area, primarily the upper reaches of George Inlet and the west central portions of Carroll Inlet, support a diversity of fish and shellfish. Important commercial and sport fish present in the area are pink, chum, coho, and sockeye salmon, steelhead and cutthroat trout, and Dolly Varden char.

The fish habitat of the Shelter Cove area is classified in several ways, including: (1) watersheds, (2) stream classification units, and (3) Aquatic Habitat Management Units.

Watersheds

A watershed is the drainage area of a stream. There are 157.5 miles of streams within the project area. Most of the watersheds within the sale area are small, usually on the order of five to ten square miles, which drain directly into either George Inlet or Carroll Inlet.

Stream Classification

Streams are classified by channel type. The channel typing system developed on the Tongass National Forest stratifies watershed, stream and lake habitats into distinctly different groups. The channel type groups are based on physical characteristics of streams and predict their physical response to different management activities. These groupings of channel types are called stream process groups. The stream process groups for the project are as follows:

Floodplain Stream Channels—There are 13.7 miles of floodplain channel type streams within the project area.

Alluvial Fans—There are 3.0 miles of alluvial fans within the project area.

Glide Streams—There are 5.4 miles of glide streams within the project area.

Estuary—These channel types are not located on Federal lands within the project area, and are confined to State and private land along George and Carroll Inlets.

Mixed Control—There are 16.1 miles of mixed control channel type within the project area.

Low Gradient Contained—There are 4.0 miles of low gradient contained channel type within the project area.

Moderate Gradient Contained—There are 17.2 miles of moderate gradient contained type within the project area.

High Gradient Contained—There are 98.1 miles of high gradient contained channel type within the project area.

Aquatic Habitat Management Units

An aquatic habitat management unit (AHMUs) is the area for management of the aquatic resource associated with the streams and lakes. The AHMU habitat represents complex interrelationships between fish habitat and forest type, geology, soils, topography, and water quality.

The AHMU is defined by channel types based on the following physical features:

1. A minimum of 100 feet on either side of streams (FSM 2526.03 and FSH 2609.2a).
2. AHMUs will be expanded to include:
   - A. Areas of unstable soil where numerous small to medium-sized v-notch streams could significantly affect the quality of the fish habitat downstream.
   - B. Floodplains, where lateral migration and/or multiple channel formation create numerous small rearing streams. On these floodplains, the AHMU will extend to the zone of influence of LOD and include areas where small rearing streams are present.
   - C. Alluvial fan channel, which exhibit regular lateral migration, from their upstream source of departure from the valley constricted (singular, incised) channel type to the downstream confluence of the floodplain.
   - D. Two hundred feet from the edge of lakes.

Table S-6 displays the overall condition of the AHMU by process group when totaled for the project area.

Table S-6
Status of AHMUs

	Total AHMU Acres	AHMU Acres Harvested	AHMU Length Harvested (Ft.)	% Acres Harvested
Floodplain	729	1.59	307	0.22
Alluvial Fan	61	0.00	0	0.00
Glides	231	0.00	0	0.00
Lakesides	960	0.00	0	0.00
Estuaries	0	0.00	0	0.00
Mixed Control	405	0.46	88	0.11
Low Gradient Contained	114	5.58	949	4.89
Mod Gradient Contained	455	3.39	653	0.75
High Gradient Contained	3,111	101.05	20,387	3.25
Total	6,066	112.07	22,384	1.85

Wildlife Resource

Many wildlife species are valuable economically or aesthetically to the people of southeast Alaska and the nation. Over 300 species of mammals, birds, amphibians and reptiles occur on the Tongass National Forest. They occupy a diverse range of land types, plant communities and special habitats.

The Wildlife Habitat Management Unit concept was established in the Southeast Alaska Area Guide. Habitat Units are a system to classify all terrestrial and aquatic habitats of a forest on the basis of habitat relationships of the forest's Management Indicator Species (MIS) (Suring and Sidle 1987). An individual Habitat Unit is an area of land or water having potential to provide habitat for one or more Management Indicator Species. The Habitat Units are divided into five broad categories: Alpine, Subalpine, Beach Fringe, Riparian and Upland Forest. An aggregate Habitat Unit, entitled Deer Winter Range, has been identified for the Sitka black-tailed deer. These Habitat Units are discussed in greater detail in the FEIS of the 1989–94 Operating Period for the Ketchikan Pulp Company Long-Term Sale Area.

Management Indicator Species are species of vertebrates or invertebrates whose population changes are believed to indicate the effect of land management activities. The Management Indicator Species are used to meet the requirements for maintenance of population viability and biological diversity and to establish management goals for species in public demand. The following species have been selected for this project: Sitka black-tailed deer, pine marten, black bear, bald eagle, river otter, hairy woodpecker, and Vancouver Canada goose.

Subsistence

Subsistence activities are conducted for a variety of reasons including, but not limited to, a means of continuing a way of life, maintaining and continuing a cultural heritage, and because of economic necessity.

The importance of subsistence is recognized in both State and Federal laws. The most important Federal law dealing with the subject is Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980.

The Alaska Department of Fish and Game, for record keeping purposes, has broken State of Alaska Game Management Units (GMUs) into smaller areas called Minor Harvest Areas. The area considered in this FEIS is located in Minor Harvest Area 407 and that portion of Minor Harvest Area 406 west of Carroll Inlet.

Subsistence users harvest different types of resources. This is because environments around communities vary. The types of resources indicated by subsistence users in and around the project area were inventoried in a report entitled the Tongass Resource Use Cooperative Survey (TRUCS). The types of resources indicated were deer, king salmon, beach greens, etc. In the TRUCS effort researchers included about 42 different types of subsistence resources. For example, Metlakatla residents harvested on the average about 4 different types of resources. Saxman residents harvested on an average about 5 different types of resources.

Salmon, trout, and some ocean dwelling bottomfish are the principal subsistence fish resources in the affected area. Pacific salmon, with the exception of Chinook, are harvested in both fresh and salt water in a variety of ways throughout the year. The sockeye salmon is probably the most important subsistence species because of its high quality flesh and ease of harvest at traditional sites.

The Sitka black-tailed deer is an important subsistence species found throughout the study area. The general hunting season is August through late November. Harvest is generally concentrated during the first few weeks of the season in August and later in November when the rut occurs. Data from the ADF&G harvest records indicate that Ketchikan is the home of the largest number of hunters in Minor Harvest Area 406 and 407.

Furbearer harvest supplements the seasonal income of many subsistence users. Different levels of trapping intensity exist, from the occasional trapper who targets primarily pine marten and beaver, to those individuals pursuing all furbearers. Harvest effort is usually concentrated along the saltwater-upland interface, and near or along major river systems. Pine marten appear to be the most old-growth dependent of the furbearers.

Environmental Consequences (Chapter 4)

Consequences of the Physical Environment

This section discusses impacts of the action alternatives on soils, wetlands, floodplains, basin hydrology, and water quality. Issues identified in scoping were soil mass movement and water quality.

Soils

Proper timber harvest planning and administration, in addition to application of Standards and Guidelines and mitigation measures can minimize soil disturbance and subsequent erosion. Most soil disturbance can be reduced to short-term impacts (5 years or less), such as sedimentation during bridge construction. Some long-term impacts will occur, such as loss of productive soil base due to road construction or landslides. Roads and landslides contribute most to sedimentation and subsequent water quality alterations.

Potentially unstable soils were identified using a mass movement index rating system. This information provides managers with knowledge of where mitigation measures may need to be applied to minimize possible adverse effects of timber harvest and road construction on soil productivity and water quality.

Acres of harvest on high and very high mass movement index (MMI) soils compares the amount of harvest on soils most sensitive to disturbance and erosion. Alternative 6 proposes the most acres of harvest on high MMI soils (1,333 acres), followed by Alternatives 4, 5, 3, and 2, with 1,326, 1,161, 981, and 814 acres, respectively. Alternative 4 proposes the most harvest acres on very high MMI soils (210 acres), followed by Alternatives 5, 3, 2, and 6, respectively (33, 32, 24, and <1 acre).

Mitigation measures applied to these unstable soils include partial suspension on high MMI soils and full suspension of logs during yarding over very high MMI soils. Using these yarding methods generally creates no more than 10 percent and 5 percent soil disturbance for each respective method. Alternative 4 is expected to create the most amount of soil disturbance on high and very high MMI soils (153.6 acres), followed by Alternatives 6, 5, 3, and 2, respectively (133.4, 117.8, 99.7, and 82.6 acres).

Road building activities are the major causes of harvest-related mass movement events and the major contributors of harvest-related sediment. Minimizing road building activities on unstable soils will lessen the possibility of mass movement events and associated impacts. Alternative 4 proposes building 20.0 miles of road on high MMI soils, followed by Alternatives 6, 5, 3, and 2, respectively (15.2, 14.2, 11.8, and 9.6 miles). Alternative 4 also proposes building 5.0 miles of road over very high MMI soils, followed by Alternatives 3, 5, 2, and 6, respectively (1.2, 0.12, 0.5, and 0.4 miles).

The total amount of disturbance on high and very high MMI soils can be determined by adding disturbance created from road construction and amount of disturbance created during falling, yarding, and timber harvest activities. A greater amount of disturbance on high and very high MMI soils will likely result in greater mass movement incidents compared to low or moderate MMI soils. Alternative 4 is estimated to create the highest total area disturbed (302.9 acres), followed by Alternatives 6, 5, 3, and 2, respectively (238.7, 221.8, 188.1, and 150.8 acres).

Wetlands

Frequency of wetlands in the project area precludes avoidance when implementing harvest and road building activities. Approximately 52 percent of the project area is classified as wetlands. It has been observed that wetland sites regenerate more slowly than non-wetland sites (in terms of volume); therefore, it is possible that merchantable timber may not be available in a 100-year rotation. Alternative 4 proposes to harvest the most forested wetland acres (1,182 acres), followed by Alternatives 5, 6, 3, and 2, respectively (1,041, 857, 457, and 318 acres).

New construction in wetlands will be limited to roads, landings and associated drainage structures. Both construction and maintenance of roads will meet Best Management Practices (BMPs) described in the State's approved program and the baseline provisions outlined in 33 CFR 323.4 (Chapter 2.4).

Impacts from roads are limited to the wetlands directly underlying the road prism and associated cuts and fills. Alternative 4 impacts the most wetland acres (307 acres) with road construction, followed by Alternatives 5, 6, 3, and 2 with 264, 250, 201, and 148 acres, respectively. Six-tenths of one acre of estuary may be impacted by road construction in Alternative 4. Estuaries in all other alternatives will not be impacted by road construction.

Each action alternative, except Alternative 5, proposes roading through VCU 742, which is LUD II designation. The proposed roads will have little impact on wetlands or unstable soils. Alternative 6 proposes to impact approximately 3.4 acres of land through soils having high MMI. Alternatives 2 and 3 will impact 1.2 acres each, followed by Alternatives 4 and 5 which will have no impact on high MMI soils. Zero acres of land will be impacted by road construction on very high MMI soils for any alternative. Approximately 3.4 acres of wetlands will be altered due to road construction in VCU 742 in Alternative 2 and 3 only, while all other alternatives will have no impacts on wetlands.

The total impact roads will have on VCU 742 will be removal of approximately 12 acres of land from production, which equates to approximately 0.04 percent of the entire VCU.

Cumulative Effects of Wetlands

Three time periods are used to display cumulative effects: (1) 1990; (2) 2000, the end of the operating plan; and (3) 2060, the end of the rotation.

Prior to 1990, approximately 1,300 acres of timber were harvested in the project area. It is not known how many of those acres were forested wetlands. Within this operating period, between 318 and 1,182 acres of forested wetlands are proposed for harvest, depending on alternative. This equates to approximately 30 percent of the total planned harvest acres (average of each alternative). Approximately 12.5 percent of the total wetlands in the project area will be scheduled for harvest at the end of the rotation.

Prior to 1990, no acres of wetlands were altered by road construction. During this 5-year operation period between 0 and 307 acres of wetlands will be altered by road construction, depending on alternative. Within the operating period an average of 53 percent of the roads planned traverse wetlands for an average of 0.8 percent of the total wetlands on the project area. At the end of the rotation, it is estimated that 1,094 acres of wetlands will be traversed by roads, which equates to approximately 3.5 percent of the total wetlands on the project area.

Floodplains

The high density of streams on the project area precludes avoiding all floodplains during timber harvest related activities. Environmental consequences of floodplains are generally limited to road construction. BMPs are used to minimize impacts to floodplains, as well as protect roads and drainage structures. Logging activities are controlled to minimize damage to stream banks and bottoms from yarding operations. Large woody debris in streams that contributes to the stream's stability and moderation of low flow energy and velocity is generally left in place.

There will be no human occupancy of floodplains as a result of any proposed activity. The proposed action would have no floodplain development, other then stream crossings. Road locations, construction measures, and drainage structures will have minimal impact on the natural and beneficial uses of floodplains.

Basin Hydrology

The hydrologic complex varies from drainage to drainage because of basin geometry and geomorphology, but over the general area there is uniformity. Compared to other areas of the United States, return to previous flow and yield after logging is very rapid if an excessive percentage of the harvest area to the total drainage is not harvested at one time.

Based on available published background data for southeast Alaska, the level of harvest for this operating period is well within the tolerances of watershed quasi-balance. Changes in water temperature and sediment delivery, while BMPs are followed, will be within the allowable State Water Quality Standards.

Water Quality

Removal of streamside trees can raise stream temperatures, especially on temperature sensitive streams. Temperature sensitive streams identified in this project area are within watershed 0102-D79A only.

Sediment inputs as a result of timber harvest are caused from mass wasting, road construction, and soil disturbance in harvest units. Roads with high sediment yield potential are usually those having gradients greater than 10 percent. Soil disturbance in V-notches will also cause sediment inputs to streams. Standards, Guidelines and Mitigation Measures will be applied to ensure water quality standards are maintained.

Overall, entries into most watersheds in the project area will be limited. Mitigation will be critical to maintain water quality in watersheds 0102-D79A, 0102-D81C, and 0102-B80C.

Consequences of the Social and Economic Environment

Visual

Alternative 1

No reductions in the visual quality of potentially affected viewsheds will occur. In places such as Salt Lagoon and the Carroll Inlet shoreline around Shelter Cove, old harvest areas will continue to regenerate and would attain eventually a partial retention visual condition.

Alternative 2

Extensive impacts immediately along potential main road corridor. Major additional visual impacts in Salt Lagoon and North Saddle Lakes areas, and head of Salt Lake valley. Moderate additional impacts around Shelter Cove. No additional impacts north and south of Shelter Cove along Carroll Inlet. Extensive impacts around Leask Cove, part of area seen from Heckman Lake and from Leask Lake.

Alternative 3

Moderate impacts immediately along potential main road corridor. Light to moderate impacts in Salt Lagoon and North Saddle Lakes areas that are close to meeting inventoried visual quality objective of partial retention. Major impacts at the head of Salt Lake meet only maximum modification visual objective. Moderate additional impacts around Shelter Cove and no additional impacts north and south of Shelter Cove along Carroll Inlet. Extensive impact in portions of Leask Cove and Leask Lake viewsheds. No impact from Naha area.

Alternative 4

Extensive impacts immediately along potential main road corridor. Very extensive impacts around Salt Lagoon and along much of Carroll Inlet. Extensive impacts in North Saddle Lakes area similar to Alternative 2. Very extensive impacts all around Salt Lake basin. No additional impacts around Leask Cove and Leask Lake or Naha area.

Alternative 5

No major arterial is proposed around Salt Lagoon as in other alternatives. Slight additional impact from Salt Lagoon that is close to meeting inventoried visual quality objective of partial retention. Moderate impacts from one unit at the head of Salt Lake. Virtually no impacts from North Saddle Lakes or Salt Lake areas. No additional impacts in Leask Cove and Leask Lake areas. No impacts from Naha area. Moderate impacts along Carroll Inlet south of Shelter Cove.

Alternative 6

Moderate impacts immediately along potential main road corridor. Moderate impacts around Salt Lagoon, North Saddle Lakes, and around Shelter Cove. Moderate to extensive impacts south of Shelter Cove along Carroll Inlet. Extensive impacts around portions of Leask Cove, Leask Lake, and head of Salt Lake basin. Very slight impacts from portion of Heckman Lake.

Recreation

The Recreation Opportunity Spectrum (ROS) provides a framework for classifying recreation opportunities available in a geographic area. These opportunities range from primitive to urban. Changes in ROS classes that would result from roading and harvesting provide an indication of the effects of the alternatives on the recreational setting, as well as on recreation opportunities.

In general, the alternatives would result in a shift from Primitive 1, Primitive 2 and Semi-Primitive Non-Motorized to Roaded Modified and Roaded Natural. Table S–7 displays the resulting ROS classes under each alternative for the entire project area. Alternative 1, which is the No Action alternative, lists the existing acres.

Table S-7

Changes in Recreation Opportunity Spectrum (ROS) Classes

ROS Classes	Alternatives 1	2	3	4	5	6
Primitive 1	4,662	1,968	2,358	2,344	3,763	2,146
Primitive 2	696	55	105	105	696	105
Semi-Primitive Non-Motorized	36,217	31,575	28,992	26,066	25,365	25,924
Semi-Primitive Motorized	2,200	2,200	2,200	2,200	2,200	2,200
Roaded Natural	1,626	2,542	2,132	3,514	2,364	2,618
Roaded Modified	14,977	22,038	24,591	26,149	25,990	27,385
Rural	0	0	0	0	0	0
Urban	0	0	0	0	0	0

Each alternative provides for a shift away from primitive recreation settings towards more roaded, motorized recreation opportunities. Alternative 5 proposes the least amount of change from the existing primitive recreation setting. In this alternative, most road building and harvest activities are far enough away from the Naha River area that this area will retain most of its primitive 2 classification. All the alternatives propose similar access to the key recreation areas, besides Naha, that the roaded recreation potential for each alternative is nearly the same.

Currently, the project area is accessible by boat or air travel until a road link from Ketchikan to the project area is built. If a road link is not built, roads developed in the project area would remain isolated and would not be accessible for the great majority of roaded recreation opportunities.

Transportation

This section discusses the effects of the alternatives in relation to the environmental consequences.

Table S-8 displays the cost of construction for the bridges, major drainage structures, and associated road costs for each alternative.

Table S-8
Transportation Development and Costs by Alternative

	Alternative					
	1	*2*	*3*	*4*	*5*[1]	*6*[1]
New Construction Miles	0	52.10	58.07	80.36	60.72	70.96
Arterial	0	7.31	9.30	14.44	9.13	15.23
Collector	0	16.61	15.81	24.18	14.33	20.67
Local	0	28.18	32.96	41.74	37.26	35.06
Total Construction MM$[2]	0	8.10	9.00	12.68	9.52	11.63
Heavy Reconstruction Miles	0	0	0	0	.07	.07
Total Reconstruction MM$	0	0	0	0	.20	.20
Bridge Reconstruction	0	0	0	0	56,000	56,000
Total Bridge Recont. MM$	0	0	0	0	.06	.06
New Bridge Construction Total Bridge Const. MM$	0	.62	.60	1.12	.55	.88
Fish Timing Costs MM$	0	.20	.19	.29	.24	.26
LTF Construction MM$ Shelter Cove	0	.25	.25	.25	.25	.25
LTF Reconstruction MM$ Hume Island	0	0	0	0	.07	.07
Total Construction, and Reconstruction Cost MM$	0	9.17	10.04	14.34	10.89	13.35

[1]Includes Estimate Share-Cost Dollars
[2]MM$ = Millions of Dollars

Alternative 4 may have an impact on the 330-foot buffer around an eagle tree. When final on-the-ground location takes place, all efforts will be taken to place the road corridor outside of the 330-foot buffer.

All stream crossings have taken into account the need for fish timing and passage with regard to any special structure needs. All of the alternatives have proposed roads which run within the stream buffers. Alternative 4 has the greatest number of miles which run within the buffers and Alternative 5 has the least miles. This intrusion into the buffered areas will be limited as much as terrain will allow.

All alternatives involve the construction of a new Log Transfer Facility (LTF) at Shelter Cove. Alternatives 5 and 6 include the existing LTF at Hume Island which is now under private ownership. Alternatives 3, 4, 5, and 6 involve roading within ANCSA areas which may be subject to Native Corporation selection. Alternative 5 has the most miles proposed within this area and Alternative 2 has no miles of road within the ANCSA area.

The following alternatives have proposed roads within State land: Alternatives 2, 3, 4, and 6, with Alternative 6 having having the greatest mileage (.4 miles) within State land. Alternative 5 has no proposed roads in State owned lands.

Timber

Table S–9 displays the volume class composition in acres scheduled for harvest by alternative and the total volume by volume class scheduled for harvest.

Table S–9
Harvest Distribution by Volume Class and Alternative

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Acres:						
Volume Class 4	0	360	602	1,133	875	990
Volume Class 5	0	1,476	1,444	2,183	1,672	1,810
Volume Class 6	0	300	101	286	34	220
Volume Class 7	0	55	84	1	0	41
Total Harvest	0	2,191	2,231	3,603	2,581	3,061
MBF:						
Volume Class 4	0	6,510	10,880	20,212	15,847	18,244
Volume Class 5	0	44,220	43,269	65,405	50,083	54,243
Volume Class 5	0	10,422	3,500	9,936	1,171	7,625
Volume Class 6	0	2,753	4,170	51	0	2,011
Total Harvest	0	63,905	61,819	95,604	67,101	82,123
Percentage of Total (Based on Acres)						
Volume Class 4	0	16.4	27.0	31.4	33.9	32.4
Volume Class 5	0	67.4	64.7	60.6	64.8	59.1
Volume Class 6	0	13.7	4.5	8.0	1.3	7.2
Volume Class 7	0	2.5	3.8	0.0	0.0	1.3

A mid-market financial analysis was performed on each alternative which schedules volume for harvest. Table S–10 summarizes these results. The market conversion is the net dollar value of the timber volume calculated by subtracting operational costs from the log value. The market conversion rate is the conversion dollar value divided by the timber volume.

Table S–10
Financial Analysis Summary

	Alternative					
Components	*1*	*2*	*3*	*4*	*5*	*6*
Sawlog MBF	0	66,773	64,935	99,832	69,961	85,276
Mid-Market Conversion (MM$)	0	0.6	0.2	–1.7	–0.8	–1.1
Mid-Market Conversion Rate $/MBF	0	9.0	3.1	–17.0	–11.4	–12.9

Alternatives 2 and 3 show a positive conversion rate for mid-market conditions.

Table S–11 displays the projected impact to the community of Ketchikan in terms of direct and indirect private-sector jobs and wages paid in millions of dollars over a 5-year period.

Table S–11

Economic Impact in Terms of Jobs and Projected Income

Components	Alternative 1	2	3	4	5	6
Jobs Created	0	54	53	81	57	70
Wages Paid (MM$) Over a 5-year Period	0	2.3	2.3	3.4	2.4	3.0

The open conditions created in clearcuts in all action alternatives will allow both Sitka spruce and western hemlock to regenerate rapidly. Even-aged stands usually contain from 10 to 75 percent spruce depending on the soil type and the age of the stand. On average, the volume of spruce in even-aged stands 75 to 100 years after harvest is about 50 percent (Taylor 1934) compared to 28 percent in existing mature and overmature stands. Based on Ketchikan pre- and post-thinning data collection, the practice of precommercial thinning results in an additional 20 percent increase in the spruce component over unmanaged stands.

Although log quality in second-growth stands is expected to be lower than in mature and overmature stands, even on sites that have been precommercially thinned, total yield per acre is expected to be higher in second-growth stands. The lower quality will be reflected in the log grades (sizes), with second-growth timber stands having fewer higher grade logs than existing mature and overmature stands. In addition, second-growth stands will have less volume in the larger diameter classes. Nevertheless, total yield per acre will be significantly greater in second-growth stands than in mature and overmature stands. The long-term result of precommercial thinning is the production of more useable fiber. Precommercial thinning also allows the Forest Service the option of reducing the rotation age because merchantable size logs are produced sooner on thinned sites than in areas not thinned. The Tongass Land Management Plan calls for precommercial thinning on approximately 6,300 acres per year.

All action alternatives except Alternative 2 have harvest units within ANCSA areas which may be subject to Native Corporation selection. Alternative 5 would harvest the most timber volume in this area.

Cultural

Based upon what is known of cultural resources in relation to the natural environment, each one of the proposed action alternatives was evaluated for potential impacts. Alternative 4 would have the heaviest impact whereas Alternative 2 would have the least effect. One presently known cultural resource site may be affected by project activities. An inventory plan for the location and protection of cultural resources will be developed pursuant to a Record of Decision. Appropriate mitigation measures will be implemented if cultural resources will be affected.

Consequences of the Biological Environment

Fisheries

The Standards and Guidelines applied to harvest units and road construction are designed to prevent degradation of fish habitat and fish capability. Effective and consistent application of these measures will prevent any significant reduction in fish habitat capability. The alternatives will be compared by the amount of harvest adjacent to high value fish habitat, whether harvest units are planned on sensitive soil types above quality spawning habitat (primarily upper Salt Creek), and whether fish enhancement projects would be accessed by the road system and could be funded by collected timber sale receipt (K-V) dollars.

Alternative 1

The no action alternative would have no new harvest and, therefore, no environmental consequences to fisheries habitat and capability. There would be no new roading in the Aquatic Habitat Management Unit (AHMU) or stream crossings associated with it.

Alternative 2

Road construction provides close access to both the Salt Creek and Nigelius Creek potential fishpass projects, and could be funded through Knudsen-Vanderberg (K-V) funds collected from timber sales. Units are located next to lower Salt Creek and, in the case of Units 747-15 and 18, cut on both sides of the Salt Creek AHMU, in its most productive section. Nine units harvest timber from sensitive soils areas, above the coho spawning area, above Salt Lake. Coho production potential of the planning area could be slightly reduced from harvest and road operations. This would be compensated by the Nigelius fish passage, if constructed.

Alternative 3

Road construction also provides close access to both potential fishpass projects. There are four units on the sensitive soil areas above Salt Creek coho spawning area. The lower portion (C3 high value habitat) does not have harvest units adjacent, so less potential exists for blow down AHMU buffers. The coho production potential could be slightly reduced from harvest and road operations. Again the coho lost could be mitigated through construction of the Nigelius Creek fishway.

Alternative 4

Road construction provides close access to the potential fishpass sites for cost effective enhancement. Six units are located on the steep sensitive soil areas above the Salt Lake coho spawning areas. Four large units adjacent to Salt Creek are located adjacent to production habitat along lower Salt Creek. The floodplain areas adjacent to unit 747-47 could be prone to windthrow, and should have higher concentrations of small unmapped side channels.

Alternative 5

The road construction provides close road access to the potential Nigelius Creek fishway. The Salt Creek fishway would lay outside of the KV collection boundary. Management activities have been deferred from most of the Salt Creek area, and does not harvest adjacent to the productive fish habitat in lower Salt Creek, and the sensitive soil areas above Salt Lake spawning areas. This alternative has the smallest risk of impacting coho production potential of any of the action alternatives. Again, construction of the Nigelius Creek fishway would mitigate any coho loss. Since no road access into Salt Creek is built, potential overharvest of Salt Creek coho stock is lessened.

Alternative 6

Harvest unit and road location allows for cost effective fishway development. This alternative has five units with hazard soil areas above productive salmon habitat of upper Salt Creek. The five units located adjacent to lower Salt Creek, particularly Units 747-43 and 47, cause particular concern, since they harvest several hundred feet adjacent to the large floodplain management unit. This would set up a greater chance for blowdown.

Wildlife

The Wildlife Section discusses impacts of the action alternatives on old-growth prescription areas, wildlife habitat, and wildlife populations. The scoping process determined that the potential effects of timber management activities on wildlife habitats and populations, particularly old-growth dependent species, were of major concern.

Old-Growth Prescription

Prior to this planning period, 202 acres of old-growth prescription were designated in the Brown Mountain Environmental Assessment. These previously documented areas have not been altered in this document. Additional acres of old-growth prescription have been proposed in Chapter 4.

A standardized location for old-growth prescription was used for all alternatives. Harvest units were "cut out" of the blocks of old-growth prescription. The old-growth prescription was refined by taking the "cut out" pattern and determining the effective block of wildlife old-growth prescription remaining in each alternative (Table S-12). The effective block procedure results in contiguous blocks of old-growth prescription and future harvesting would occur between the harvest units.

Table S-12
Acres of Old-Growth Prescription by Alternative

Alternative					
1	*2*	*3*	*4*	*5*	*6*
6,439	2,566	3,767	2,864	5,805	3,006

The contiguous landscape of old-growth prescription defined in Alternative 5, between the Naha LUD II and George Inlet, and nearly to Carroll Inlet, was carefully designed to assure dispersal of wildlife from the Naha LUD II to areas of intensive, traditional use of wildlife. The Naha is known to be a prime producer of many wildlife species, but successful dispersal from the Naha is necessary to maintain hunting and trapping opportunities elsewhere, as well as to recolonize habitats where the animals are lost. Without excellent biological corridors, some wildlife populations within the Naha are more likely to grow until they harm their food base there. If it were not for consideration of the Naha LUD II and its excellent wildlife production, the contiguous large "block" of old-growth prescription in Shelter Cove would have been defined to be much more blocky—more round or square as opposed to the "block's" 11 miles of total length and average width of only 0.6 mile.

Furthermore, the landscape designated for old-growth prescription between the Naha and George Inlet and Saddle Lakes, in Alternative 5, was Priority 1 Habitat in the Interagency Forest Habitat Integration Program analysis. The prescription landscape also includes most of the best fisheries habitats in the Shelter Cove Assessment Area, and an unusually high density of prime riparian habitats which would be difficult and expensive to protect under Alternatives 2, 3, 4 and 6. The prescription proposed by Alternative 5 also includes much of the best black bear, marten and deer habitats. The landscape-sized "block" is large enough to be fully effective for marten and deer (both species have reduced productivity in fragmented forests).

Finally, the total habitat capability of the rare Queen Charlotte goshawk, within the combined landscape of the Naha LUD II and the old-growth landscape block defined for Alternative 5 of Shelter Cove, is estimated at only 5 or 6 pairs. Fragmenting the habitat between the Naha and Salt Lagoon (George Inlet) could significantly reduce this local population, especially by removing habitat important for pre-breeding nutrition.

Wildlife Habitats and Population Estimates

Potential Management Indicator Species (PMIS) are species of vertebrates or invertebrates whose population changes are believed to indicate the effect of land management activities. The PMIS are used to establish the requirements for maintenance of population viability and biological diversity and to establish management goals for species in public demand.

For each PMIS, effects analysis are discussed for current conditions, the year 2000, and general projections for 2060. Acres of habitat by alternative have been calculated for each PMIS (Table S-13). Rough population estimates by alternative have been calculated for all PMIS except the Vancouver Canada goose.

Table S-13

Acres of Habitat by Species

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Deer (< 800 ft.*)	16,023	14,539	14,594	13,017	13,980	13,635
Deer (> 800 ft.*)	11,796	11,091	10,994	11,198	11,258	11,122
Pine Marten	25,628	23,464	23,407	22,035	23,058	22,578
Black Bear	2,263	2,241	2,251	2,162	2,241	2,242
Bald Eagle	2,028	2,006	2,016	1,945	2,006	2,007
River Otter	2,171	2,149	2,159	2,088	2,149	2,150
Hairy Woodpecker	22,269	20,219	20,204	18,767	19,806	19,322
Vancouver Canada Goose	1,378	1,356	1,368	1,334	1,356	1,357

*in elevation

Table S-14

National Forest Habitat Capability (Number of Animals) In the Year 2000

	Alternative					
Species	*1*	*2*	*3*	*4*	*5*	*6*
Deer, All Elevations*	1,807	1,408	1,523	1,280	1,567	1,400
Pine Marten**	76	43	57	39	64	50
Black Bear	87	79	82	79	86	80
Bald Eagle	73	73	73	70	73	73
River Otter	11	11	11	11	11	11
Hairy Woodpecker*	464	288	344	303	406	298

*block size effects incorporated

Subsistence

Access to the project area is primarily by water. Areas of concentrated subsistence use are limited to the saltwater beach fringe. Table S-15 displays the amount of timber scheduled for harvest within this area of concentrated use.

Table S–15

Timber Scheduled for Harvest in Areas of Concentrated Subsistence Use (Acres)

Alternative	Acres Scheduled
1	0
2	0
3	2
4	57
5	0
6	0

Old-growth beach fringe not scheduled for harvest is reserved from harvest to meet wildlife old-growth retention needs.

Table S–16 displays the number of deer the habitat in the project area can support now and in the year 2000 by alternative and the number of deer needed to meet growth in demand.

Table S–16

Deer Harvest and Habitat Capability for the Shelter Cove Project Area

	No. of Deer that Habitat Can Support in Year		Population of Deer Needed to Meet Demand
Alternative	*1990*	*2000*	*1990*
1	1,807	1,807	1,380
2	1,807	1,408	1,380
3	1,807	1,523	1,380
4	1,807	1,280	1,380
5	1,807	1,567	1,380
6	1,807	1,400	1,380

None of the alternatives are expected to cause a restriction of subsistence deer hunting in either the short or the long term.

Black bear and furbearer species play a very minor role in subsistence use for both Metlakatla and Saxman residents. None of the alternatives are expected to cause a restriction of subsistence in either the short or long term.

Because of the eligibility determination and the protection measures provided in this document for streamside zones, none of the alternatives are expected to cause restriction of subsistence fishery in either the short or the long term.

Standards and Guidelines and Mitigation Measures which will be implemented as part of the selective alternative are designed to maintain fish and wildlife habitat productivity at as high a level as possible.

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Purpose and Need

Chapter 1

Purpose and Need

Introduction

This Final Environmental Impact statement (FEIS) has been prepared by the United States Forest Service to display the environmental consequences of harvesting between 61.8 and 95.6 million board feet of timber for the independent sale program on the Ketchikan Ranger District. The 60,383-acre project area is located approximately 18 air-miles northeast of Ketchikan, Alaska in and around Shelter Cove and George Inlet areas of the Tongass National Forest. The project area is subdivided into value comparison units (VCUs) roughly the equivalent to major watersheds. The management areas included in the study area are portions of K33, K39 and K35, which are composed of VCUs 742, 747, 748 and VCUs 746 and 753 respectively. The planning period is from 1991–1995. Figures 1-1 and 1-2 in the Maps document display the project area and its geographic relationship to Ketchikan.

Analysis of each alternative will disclose: (1) areas considered for harvest and within which harvest is authorized, as established by the Tongass Land Management Plan, (2) the location of new roads needed for access, (3) the type of logging systems to be used, and (4) the bay and site location of log transfer facilities.

Organization of the Document

This FEIS is presented in four chapters as follows:

Chapter 1—Purpose and Need for Action. This chapter explains the who, what, where, and why of the proposed project. It explains the decision(s) that must be made, the issues identified through public involvement, and Federal and State permits or licenses necessary to implement the project.

Chapter 2—Alternatives. This chapter describes the process used to formulate the alternatives; it gives a presentation and a comparison of the alternatives, with information on how the alternatives would be implemented with measures to protect the environment.

Chapter 3—Affected Environment. This chapter is a review of the project area and its related resources which would be affected by the six alternative actions.

Chapter 4—Environmental Consequences. This chapter describes the changes to the environment that are likely to occur with the implementation of any of the alternatives.

Background

Initially, the FEIS was to have been conducted on Management Areas K32 through K40, which are the non-wilderness portions of Revillagigedo Island (Revilla Island). The intent was to meet the public's demand for multiple use throughout Revilla Island. This objective was to have been accomplished by integrating timber sales and their associated road

system with a road link to Ketchikan. However, management decided to eliminate the road link to the project area; therefore, this FEIS will describe alternatives for the harvest of timber in and around Shelter Cove and George Inlet areas of the Tongass National Forest. The objective is to meet public concerns associated with the harvest of timber as identified in the scoping process.

This FEIS is not a decision document. It is a document disclosing the environmental consequences of timber harvest and alternatives for that action to the public so they may make their comments known. The alternatives displayed in this FEIS are applicable only to National Forest System land.

The planning record contains the detailed information used to develop this FEIS. Because the planning records are too voluminous to include within this document, they are incorporated by reference at appropriate points in the text and appendices of this document. The planning record for this project is available for inspection during regular business hours at the Tongass National Forest, Ketchikan Ranger District, Ketchikan, Alaska.

Relationship to Other Planning Levels

National Level

The Forest and Rangeland Renewable Resources Planning Act of 1974 (Resources Planning Act), as amended, responds to current and projected natural resource goals. The Resources Planning Act requires that the Forest Service make an assessment of the forest and rangeland renewable resources every ten years and develop a program for managing those resources every five years. The assessment displays the future management of the National Forest System land. The Resources Planning Act program provides Congress with a basis to link annual budgets with long-term resource needs. Information from the Shelter Cove FEIS will be combined with data from other areas and used to verify current plans and programs. It will help modify future plans to ensure a sustained yield of goods and services from the National Forest System which maximizes public benefits in an environmentally sound manner.

For additional information regarding issues addressed in the Forest and Rangeland Renewable Resources Planning Act, contact the Ketchikan Ranger District where a copy is available for review.

Regional Level

The Alaska Regional Guide and its FEIS were filed with the Environmental Protection Agency in December 1983. The Alaska Regional Guide addresses regional issues specific to Alaska, established management standards and guidelines, and displays outputs for the Tongass National Forest. Activities and outputs scheduled in this FEIS are consistent with the Regional Guide and its FEIS. In addition, this FEIS tiers to the Alaska Regional Guide and its FEIS.

For information regarding the issues identified in the FEIS for the Alaska Regional Guide, please contact the Ketchikan Ranger District where copies are available for review.

Forest Level

The National Forest Management Act (NFMA) directs each Forest to prepare an overall plan of activities. As a result of NFMA direction, the Tongass Land Management Plan (TLMP) was adopted as direction in the Tongass National Forest in 1979. TLMP was filed with the Environmental Protection Agency in March 1979. It established Land Use Designations (LUDs) to guide management of the land for certain uses. The LUDs

describe the activities that may be authorized as part of the management of a given area. The LUDs were assigned to areas known as Value Comparison Units (VCUs), which are roughly equivalent to large watersheds. Table 1-1 displays the distribution of VCUs and their associated LUDs and Management Areas for the project area. The reader will notice that activity is planned for VCU 742, which has a Land Use Designation II. Areas allocated to LUD II are to be managed in a roadless state to retain their wildland character, however, this would permit wildlife and fish habitat improvement and primitive recreation facility development. Roads will not be built except to serve authorized activities such as mining, power and water developments, aquaculture developments, transportation needs determined by the State of Alaska, and vital Forest transportation system linkages. (Tongass Land Management Plan amended winter 1985-1986, Alaska Region Admin. Doc. No. 147, p. 8-9.)

For additional information regarding major issues addressed in the Tongass Land Management Plan and descriptions of the Land Use Designations, please contact the Ketchikan Ranger District, where copies are available for review.

TLMP was amended in 1986. Forest plan revision is now in progress and a draft EIS was released in July 1990.

Table 1-1 displays the Land Use Allocations within the project area, the VCUs and the corresponding acres associated with each land use allocation.

Table 1-1
Land Use Allocations

Management Area	VCU	Land Use Designation	Acres
K33	742	II	31,805
K39	747	III	16,737
	748	III	19,937
K35	746	IV	31,042
	753	III	29,307

Project Level

This FEIS presents a range of alternatives, including the Forest Service preferred Alternative, and tiers to the higher level plans and decisions made in those plans. It describes and displays site-specific descriptions and effects of the proposed activities in Alternatives 1 through 6.

The ID Team used a systematic, interdisciplinary approach to analyze the proposed project, estimate the environmental effects, and prepare this final Environmental Impact Statement. The planning process followed specific legal requirements in accordance with the National Environmental Policy Act (NEPA). A copy of the National Environmental Policy Act is available for review at the Ketchikan Ranger District office.

Planning was coordinated with Federal and State reporting and planning efforts. Coordination will continue throughout project implementation and monitoring. Planning records for this project are available at the Ketchikan Ranger District Office in Ketchikan, Alaska.

Responsible Official and Decision To Be Made

The Forest Supervisor is the deciding officer who must decide where to harvest timber, and how much timber to make available for harvest. The decision includes log transfer facility site location, road location, and harvest unit design, location, and size. The Forest Supervisor can decide to: (1) take No Action; (2) emphasize timber economics by selecting timber for harvest with the greatest potential for economic return; (3) provide for timber harvest with emphasis given to recreation potential and visual management by dispersing the timber harvest; (4) maximize timber harvest; (5) minimize timber harvest activity and emphasize wildlife habitat maintenance; or (6) retain the dispersion pattern of harvest units, which emphasizes recreation and visual resources, while increasing the timber harvest to improve timber sale economics.

Public Involvement

The Forest Service worked hard to identify major issues and concerns affecting this project. The Forest Service involved members of the public, interest groups, and State and Federal agencies. The public was asked to comment on the project through the processes outlined below.

1. Public Mailing—On April 12, 1985, a response form for public comment was mailed to 128 individuals or groups that had previously shown interest in Forest Service plans and projects. On December 22, 1986, a letter was mailed to all individuals and groups who had commented during the initial scoping session to notify these individuals that an EIS would be prepared and that their comments were welcome.
2. Local News Media—Announcements about the project were printed in the Ketchikan Daily News on April 12, 1985. The project was discussed on the local FM radio station on May 9, 1985. The project was the topic of nine articles in the Ketchikan Daily News during the scoping period. Approximately 1,000 newspaper inserts were distributed regarding the project. On January 7, 1991, the project was discussed on the local FM radio station. The project was the topic of two articles in the Ketchikan Daily News, between November 28, 1990, and February 14, 1991.
3. Notice of Intent to Prepare an Environmental Impact Statement—A Notice of Intent was published in the Federal Register in January of 1987, when it was decided that an EIS was to be completed for the project.
4. Local Meetings—On April 12, 1985, an open house was held at the Ketchikan Ranger District that attracted 35 persons. On December 7, 1989, a meeting on subsistence was held at Saxman. On December 12, 1989, a meeting on subsistence was held at Metlakatla. On January 14, 1991, and January 24, 1991, a formal subsistence hearing was held at Thorne Bay, Alaska. On January 15, 1991, a formal subsistence hearing was held at Saxman, Alaska. On January 16, 1991, a formal subsistence hearing was held at Metlakatla, Alaska. On January 17, 1991, a formal subsistence hearing was held at Wrangell, Alaska. On January 10, 1991, an informational meeting was held in Ketchikan, Alaska. On January 18, 1991, an informational hearing was held for the public at the Ketchikan Ranger District. On February 12, 1991, an informational meeting was held in Ketchikan.
5. Individual Contacts—Informal presentations and discussions have been made with eight local organizations.

6. Public Comment—Public comments on the Shelter Cove Draft Environmental Impact Statement were received from November 27, 1990, to February 1, 1991. A total of 24 comments were received.

Copies of the legal notices and newspaper articles are included in the planning records. The comments received are part of the planning record and are available at the Ketchikan Ranger District, Ketchikan, Alaska.

Public Issues Outside the Scope of This FEIS

During the public involvement process, four issues were raised that are considered to be outside the scope of this FEIS. These issues are as follows.

1. Change the Land Use Designations of some Value Comparison Units

   Several suggestions were made that would necessitate changing the LUDs established in TLMP. This FEIS is tiered to TLMP and cannot alter the decisions made in TLMP.

2. Postpone the FEIS until the revision of TLMP is completed.

   The concern was expressed that this FEIS could unfairly prejudice the decisions that would be made in the revision of TLMP and should therefore be postponed until the revision is completed. It is felt that this FEIS will provide valuable local information to the revision planning without constraining the decision to be made.

3. Below Cost Timber Sales

   Persons requested that any proposed timber sale be examined to determine if the cost to the government of preparing the timber for sale exceeded the returns to the Government. The relationship between timber values and road costs is an important component of this issue. Cost/benefit can only be made based on market conditions at the time of sale, consequently only relative efficiencies can be examined.

4. The Extent and Location of Development Outside the Project Area

   Because the project area was reduced in size, comments regarding the general level of development in the following areas outside the project are no longer considered issues. The areas identified as important to forest users were; (1) Wolf Lakes and Orchard Creek, (2) Clover Pass, Moser Bay and Carroll River.

5. Road Link Between Ketchikan and the Project Area

   The proposed road link is a separate project and independent from this FEIS. The road link project will require a separate NEPA document displaying the issues and alternatives developed during the public involvement process.

Public Issues Within the Scope of This FEIS

The following public issues and opportunities were identified during the scoping process and were used to develop the alternatives to the proposed action.

1. Effects of Timber Harvest on Visual and Recreation Resources

   Forest management activities could impact existing recreational pursuits of users of Revilla Island National Forest land. More specifically, increased human access, timber harvest and other developments could affect roadless and wilderness recreation,

hunting, fishing, scenic quality, and existing cabins and other recreation facilities.

The quality and types of recreation activities available to Ketchikan residents could be enhanced by developing a road system that, when linked to Ketchikan, allows access to potential recreational sites.

2. Timber Sale Economics

   A variety of comments were received concerning the economics of timber harvest and associated road building and the possible effects on the local community.

3. Effects of Timber Harvest on Fish Habitat

   Fisheries resources are important to area residents for commercial, subsistence, and/or recreational reasons.

   Public concern was expressed regarding the possible effects of increased human access and of logging on fish habitats including possible economic effects.

   The opportunity exists, because of accessibility, to initiate a salmon enhancement project on Salt Creek.

   Buffer strips have been identified as an issue in the protection of fish habitat. The effects of buffers will be addressed.

4. Effects of Timber Harvest on Wildlife Habitat

   Wildlife resources are important to area residents for commercial, subsistence, and/or recreational reasons.

   Increased human access, timber harvest, and other developments could impact wildlife habitats and populations. Hunting, trapping, noise levels, and poaching were specific aspects of increased human activities that were identified.

5. Effects of Timber Harvest on Soils and Water

   Concern was expressed regarding the possible effects of road building and logging activities on steep slopes and unstable soils. Concern was expressed that all plans should protect soil resources and water quality.

6. Protection of Subsistence Use Areas

   The potential impact of activities implemented through this plan on subsistence was identified as a concern.

Federal and State Permits or Licenses

Permits must be obtained from other agencies to implement some of the facilities and activities specified in this document. Required permits and licenses and the issuing agencies include:

1. U.S. Army Corps of Engineers

   - Approval of the discharge of dredge or fill materials into water of the United States under Section 404 of the Clean Water Act.
   - Approval of the construction of structures or work in navigable water of the United States under Section 10 of the River and Harbor Act of 1899.

2. Environmental Protection Agency

   - National Pollution Discharge Elimination System (402 permit).
   - Review Spill Prevention Control and Countermeasure Plan.

3. State of Alaska—Department of National Resources
   - Tideland Permit and Lease or Easement.
4. State of Alaska, Department of Environmental Conservation
   - Solid waste disposal permit.
   - Certification of compliance with Alaska Water Quality Standards (401 Certification).

Coastal Zone Management

The Coastal Zone Management Act of 1976 excludes Federal lands from the Coastal Zone. However, the Act requires that when Federal agencies conduct activities or undertake development that they be consistent to the maximum extent practicable with the approved State Coastal Management Program.

The Alaska Coastal Management Plan incorporated the Alaska Forest Resources and Practices Act of 1979 as the applied standards and guidelines for timber harvesting and processing. The Forest Service Standards and Guidelines and Mitigation Measures described in Chapter 2 of this document are fully consistent with the State Standards.

Based on the analysis presented in this document, the action and activities are consistent to the maximum degree practicable with the Alaska Coastal Management Plan.

Chapter 2

Alternatives Including The Proposed Action

Chapter 2

Alternatives Including The Proposed Action

This chapter describes the alternatives considered by the Forest Service, their related issues and the impacts of these alternatives. The chapter is divided into nine sections: (A) process used to formulate the alternatives, (B) alternatives eliminated from detailed consideration, (C) alternatives considered in detail during the environmental analysis, (D) a summary of the comparative impacts of these alternatives, (E) standards, guidelines, and mitigation for the alternatives, (F) log transfer facilities, (G) other requirements, and (H) monitoring.

Process Used To Formulate Alternatives

Alternative formulation began after completion of the scoping process and was designed to address public issues, Forest Service concerns, and opportunities identified in scoping. The following general guidelines were used to formulate alternatives:

1. Address the Issues Identified During Scoping: This insures that the interests of the various citizens, groups and organizations that could be affected by this project are reflected in the alternatives.

2. Consider the Capability of the Land to Produce Resources: This allowed the team to develop alternatives that planned for wise use of the resources through time and prevented consideration of alternatives that would have allocated more resources than available.

3. Evaluate a Reasonable Range of Alternatives: The issues, the ways of addressing the issues, and possible levels of resource use on Revilla Island vary widely. The ID Team concentrated on providing a range of alternatives by varying the amounts and mixes of resources committed under each alternative and by varying the number and kinds of activities to be conducted.

4. Conform to TLMP LUD Designations: This FEIS is tiered to the TLMP and its 1985–86 amendment, and adopts its major decisions. The activities included in each alternative were planned to conform with the purposes and management implications of the Land Use Designations.

5. Follow an Interdisciplinary Process: This systematic, interdisciplinary approach insures the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on the environment.

Alternatives Eliminated from Detailed Consideration

Two alternatives were examined, but not considered for detailed study in this FEIS. This section presents those alternatives and the rationale for not considering them further.

1. Single Resource or Issue—Alternatives that focused only upon one resource or issue were eliminated from consideration as implementable alternatives. It was suggested that timber development be intensified on Revilla Island so that timber harvest could be eliminated on Cleveland Peninsula. This type of alternative would not have met the objectives of planning for multiple use/resource management guiding this FEIS.
2. Road Link Between Ketchikan and Project Area—This proposed road link is a separate project and independent from this FEIS. The road link project will require a separate NEPA document displaying the issues and alternatives developed during the public involvement process.

Alternatives Considered in Detail

Alternative 1—No Action

Under this alternative no new activities would be scheduled during the 1991–95 period in Shelter Cove and George Inlet areas of the Tongass National Forest. Current activities such as issuing free use permits and cooperation with State/Borough governments and private groups and individuals regarding land ownership concerns would continue.

This alternative would have no scheduled outputs or activities and serves as the baseline against which the impacts of all other alternatives will be measured. Table 2-1 displays the proposed timber harvest by VCU for this alternative. For a description of the existing environmental conditions which will serve as the baseline against which the impacts of all other alternatives will be measured, refer to Chapter 3 of this document. Chapter 3 reviews the project area and its related resources.

Table 2-1
Alternative 1: Proposed Timber Harvest by VCU

VCU	Total Acres	Acres Scheduled	Volume Scheduled	Number of Units	Volume Class (Acres) 4	5	6	7
742	31,805	0	0	0	0	0	0	0
746	14,406	0	0	0	0	0	0	0
747	16,737	0	0	0	0	0	0	0
748	19,937	0	0	0	0	0	0	0
753	9,303	0	0	0	0	0	0	0

Alternative 2—Timber Economics Emphasis

Description

The objective of this alternative is to develop an alternative with standards and guidelines provided for by all resources, including fish, wildlife, visual, recreation, and timber. Emphasis is given to timber economics by selecting timber stands with the greatest potential for economic return. Roads are located primarily to access a moderate level of timber harvest. This alternative provides for:

A. The harvest of 63.0 million board feet of timber in VCUs 746, 747, and 748, representing 2,191 acres.

B. The transfer of all timber to the water at the proposed Log Transfer Facility at Shelter Cove.

C. The contribution of a yearly average of 6.3 million board feet of timber to the Ketchikan economy.

D. The construction of a total of 52.1 miles of new road during the planing period.

E. The average harvest unit size of 49.8 acres.

F. 100-foot buffer strips on all class I and II streams flowing directly into class I streams.

This alternative emphasizes timber economics. No harvest is seen from communities, major marine travel routes or developed recreation sites.

Figure 2–1 in the Maps document displays where the harvest activities are proposed.

Table 2–2 displays in what VCUs timber harvest will occur, the amount of timber harvest scheduled during the next five years, the number of harvest units and volume class to be harvested in each VCU.

Table 2–2

Alternative 2: Proposed Timber Harvest by VCU

VCU	Total[1] Acres	Acres Scheduled	Volume[4] Scheduled	Number[3] of Units	Volume Class (Acres) 4	5	6	7
746[2]	14,406	588	16,615	9	92	447	50	0
747	16,737	1,475	42,719	32	235	995	244	0
748	19,937	128	4,571	4	33	34	6	55
		2,191	63,905					

[1]Will not agree with TLMP figures because of: (1) adjustment made to reflect changed State and Native selections; and (2) inclusion of all water bodies.

[2]Only part of the VCU is within the project area.

[3]Includes parts of units that may overlap with adjacent VCUs.

[4]Million board feet sawlog volume.

Table 2–3 displays the total acres and volume that will be harvested in this alternative by logging system. A logging system is a method for transporting logs from the forest, after they have been cut, to a collecting point using a powered cable. One end of the log or both ends are lifted clear of the ground depending upon the system used and the topography of the ground.

Table 2–3

Alternative 2: Total Acres of Harvest by Logging System

Logging System	Acres	Volume (MMBF)
Highlead	779	23,277
Slackline	871	25,364
Live Skyline	52	1,462
Running Skyline	489	13,802
Standing Skyline	0	0
Helicopter	0	0
	2,191	63,905

Table 2-4 displays the miles of road scheduled during this planning period by VCU, by road classification and by the number of stream crossing AHMU Classes. For a description of AHMU Classes, please refer to Chapter 3 under the Fisheries section of the affected biological environment.

Table 2-4
Alternative 2: Forest Development Road Status

VCU	Existing Miles	Total[1] Planned Miles	Miles[2] Scheduled in This Document	Road Classification (Miles) *Arterial*	*Collector*	*Local*	Number Stream Crossing—AHMU *Class 1*	*Class 2*	*Class 3*
742	0	4.24	2.55	.00	1.34	1.21	0	0	1
746	0	84.91	15.81	4.08	4.14	7.59	8	0	0
747	5.02	93.00	33.01	3.23	11.13	18.65	4	4	28
748	29.90	81.63	.73	.00	.00	.73	0	0	0
753	.87	47.14	.00	.00	.00	.00	0	0	0
	35.79	310.92	52.10	7.31	16.61	28.18	12	4	29

[1]Total planned miles is the total road system needed to access all acreage that would be available under this alternative. Available acreage does not include accessible acreage in old-growth habitat prescription, etc.

[2]Mileage totals may differ slightly from totals found in other tables due to rounding.

Alternative Development Guidelines

The following general direction was used by the ID Team in developing this alternative. The development guidelines are not necessarily the Standards and Guidelines to be used in implementation. For a complete listing of the Standards and Guidelines and Mitigation Measures used in implementation please refer to Section E of this chapter.

Visual/Recreation

Recreation development and management will take advantage of opportunities created by road construction and timber harvest. However, harvest units in most cases will not be located to retain or create recreation opportunities. The exception to this is the possible development of a campground in the North Saddle Lake area.

The mainline road will be designed with timber harvest on both sides of it. Cutting units can be located near or adjacent to Salt Lake and North Saddle Lake.

Timber/Transportation

Timber harvest would be concentrated in volume class 5 and volume class 6 stands to improve the economics of timber harvest.

Timber harvest would be concentrated in units where low cost equipment, such as highlead or short span skyline, could be used.

Fish/Wildlife

Units would be designed to use streams as a yarding divide to prevent damage to streambanks and to keep logging debris from entering streams. Fisheries habitat management would meet or exceed the guidelines in the Aquatic Habitat Management Handbook FSH 2609.24. Eagle nest trees would be protected with a minimum 330 foot (100 meter) buffer zone around each eagle nest tree. Scheduling in deer winter range would be minimized.

The Salt Creek falls, a barrier to pink and chum salmon, lies within the KV collection boundary. Money from timber receipts would be collected to finance modification of the waterfall to allow upstream passage of chum and pink salmon.

Soils/Water

All alternatives must be consistent with standards and guidelines established in TLMP.

High and very high mass movement index soils will be avoided, to the extent possible.

State water quality standards will be met.

Executive Order 11990, as amended (42 U.S.C. 4321 et seq.), and as it pertains to modification or destruction of wetlands, will be met.

Executive Order 11988, as it pertains to floodplain development, will be met.

The National Forest Management Act (NFMA) 219.27 (12) (e), as it pertains to riparian habitat management, will be met.

Subsistence

Subsistence guidelines as outlined in Section 810 of ANILCA will be met.

Alternative 3—Recreation/Visual Resource Emphasis

Description

This alternative emphasizes using less visible and more widely dispersed harvest units with standards and guidelines provided by all resources, including fish, wildlife, visual, recreation, and timber. Emphasis would be given to recreation and visual management. This alternative provides for:

A. The harvest of 61.8 million board feet of timber in VCUs 746, 747, and 748, representing 2,231 acres.

B. The transfer to the water of all timber at the proposed Log Transfer Facility at Shelter Cove.

C. The contribution of a yearly average of 6 million board feet to the Ketchikan economy.

D. The construction of a total of 58.07 miles of new road during the planning period.

E. The average harvest unit size of 43.8 acres.

F. 100-foot buffer strips on all class I and II streams flowing directly into class I streams.

This alternative emphasizes visual management and the potential for recreation by not selecting harvest units next to potential recreation opportunities and marine travel routes.

Figure 2-2 in the Maps document displays where the harvest activities are proposed.

Table 2-5 displays in what VCUs timber harvest will occur, the amount of timber harvest scheduled during the next five years, the number of harvest units, and volume class to be harvested in each VCU.

Table 2-5

Alternative 3: Proposed Timber Harvest by VCU

VCU	Total[1] Acres	Acres Scheduled	Volume[4] Scheduled	Number[3] of Units	Volume Class (Acres) 4	5	6	7
746[2]	14,406	690	18,148	20	196	484	10	0
747	16,737	1,404	38,324	30	375	935	91	3
748	19,937	137	5,347	3	31	25	0	81
		2,231	61,819					

[1]Will not agree with TLMP figures because of: (1) adjustment made to reflect changed State and Native selections; and (2) inclusion of all water bodies.

[2]Only part of the VCU is within the project area.

[3]Includes parts of units that may overlap with adjacent VCUs.

[4]Million board feet sawlog volume.

Table 2-6 displays the total acres and volume that will be harvested in this alternative by logging system.

Table 2-6
Alternative 3: Total Acres of Harvest by Logging System

Logging System	Acres	Volume (MMBF)
Highlead	709	19,132
Slackline	720	20,602
Live Skyline	52	1,360
Running Skyline	742	20,602
Standing Skyline	8	251
Helicopter	0	0
	2,231	61,819

Table 2-7 displays the miles of road scheduled during this planning period by VCU, by road classification, and by the number of stream crossing AHMU Classes.

Table 2-7
Alternative 3: Forest Development Road Status

VCU	Existing Miles	Total[1] Planned Miles	Miles[2] Scheduled in This Document	Road Classification (Miles) Arterial	Collector	Local	Number Stream Crossing—AHMU Class 1	Class 2	Class 3
742	.00	4.27	2.75	.00	1.34	1.41	0	0	1
742	.00	4.27	2.75	.00	1.34	1.41	0	0	1
746	.00	85.69	21.99	4.08	4.29	13.62	6	1	4
747	5.02	89.92	32.23	5.22	10.18	16.83	4	3	19
748	29.90	81.98	1.10	.00	.00	1.10	0	0	0
753	.87	47.17	.00	.00	.00	.00	0	0	0
	35.79	309.03	58.07	9.30	15.81	32.96	10	4	24

[1]Total planned miles is the total road system needed to access all acreage that would be available under this alternative. Available acreage does not include accessible acreage in old-growth habitat prescription, etc.
[2]Mileage totals may differ slightly from totals found in other tables due to rounding.

Alternative Development Guidelines
The following general direction was used by the ID Team in developing this alternative. The development guidelines are not necessarily the Standards and Guidelines used in implementation. For a complete listing of the Standards and Guidelines and Mitigation Measures used in implementation, please refer to Section E of this chapter.

Visual/Recreation
Recreation development and management opportunities will be emphasized by increasing access by roads and by limiting harvest units to outside of lake and stream areas. Trails could be developed to Salt Lake, Salt Creek and South Saddle Lake. A campground and boat ramp could be developed at North Saddle Lake, and a boat ramp and dock at Shelter Cove.

The mainline road will be designed to have some harvest units on both sides of it. Whenever possible, the road will be sited with cutting units on one side only to lessen the visual impact. Timber harvest units will not be located adjacent to potential recreational lakes and streams or marine travel routes.

Timber/Transportation

Approximately 25 percent of the harvest acres would be scheduled in low volume stands.

Timber harvest would be directed away from high value primitive and semi-primitive recreation areas.

Average size of harvest units would be smaller than for other alternatives.

Fish/Wildlife

Road location will allow for recreation fishing at Salt Creek Lakes.

Harvest units will be dispersed to lesson impacts to fish habitat.

The Salt Creek falls, a barrier to pink and chum salmon, lies within the KV collection boundary. Therefore, money will be collected from timber receipts to finance modification of the waterfall to allow upstream passage of chum and pink salmon.

Harvest units will be selected near Salt Creek to provide access for fish barrier modification.

Fisheries habitat management would meet management guidelines in the Aquatic Habitat Management Handbook, FSH 2609.24.

Maintain large continuous old-growth stands.

Locate harvest units away from the saltwater to protect deer winter range.

Soils/Hydrology

All alternatives must be consistent with standards and guidelines established in TLMP.

High and very high mass movement index soils will be avoided, to the extent possible.

State water quality standards will be met.

Executive Order 11990, as amended (42 U.S.C. 4321 et seq.), and as it pertains to modification or destruction of wetlands, will be met.

Executive Order 11988, as it pertains to floodplain development, will be met.

The National Forest Management Act (NFMA) 219.27 (12) (e), as it pertains to riparian habitat management, will be met.

Subsistence

Subsistence guidelines as outlined in Section 810 of ANILCA will be met.

Alternative 4—Timber Volume Emphasis

Description

This alternative places greater emphasis on timber volume than the other alternatives. Standards and guidelines for other resource protection are met while maximizing timber harvest. This alternative provides for:

A. The harvest of 95.6 million board feet of timber in VCUs 746, 747, and 753, representing 3,603 acres.

B. The transfer to the water of all timber at the proposed Log Transfer Facility at Shelter Cove.

C. The contribution of a yearly average of 9.5 million board feet of timber to the Ketchikan economy.

D. The construction of a total of 80.36 miles of new road.

E. The average harvest unit size of 70.7 acres.

F. 100-foot buffer strips on all class I and II streams flowing directly into class I streams.

Figure 2-3 in the Maps document displays where the harvest activities are proposed.

Table 2-8 displays in what VCUs timber harvest will occur, the amount of timber harvest scheduled during the next five years, the number of harvest units, and volume class to be harvested in each VCU.

Table 2-8
Alternative 4: Proposed Timber Harvest by VCU

VCU	Total[1] Acres	Acres Scheduled	Volume[4] Scheduled	Number[3] of Units	Volume Class (Acres) 4	5	6	7
746[2]	14,406	1,464	37,747	21	489	910	65	0
747	16,737	1,480	41,949	18	304	954	221	1
753	19,937	659	15,908	13	340	319	0	0
		3,603	95,604					

[1]Will not agree with TLMP figures because of: (1) adjustment made to reflect changed State and Native selections; and (2) inclusion of all water bodies.

[2]Only part of the VCU is within the project area.

[3]Includes parts of units that may overlap with adjacent VCUs.

[4]Million board feet sawlog volume.

Table 2-9 displays the total acres and volume that will be harvested in Alternative 4 by logging system.

Table 2-9
Alternative 4: Total Acres of Harvest by Logging System

Logging System	Acres	Volume (MMBF)
Highlead	1,396	36,735
Highlead	1,396	36,735
Slackline	1,343	36,725
Live Skyline	84	2,187
Running Skyline	780	19,957
Standing Skyline	0	0
Helicopter	0	0
	3,603	95,604

Table 2-10 displays the miles of road scheduled during this planning period by VCU, by road classification and by the number of stream crossing AHMU Classes.

Table 2-10
Alternative 4: Forest Development Road Status

VCU	Existing Miles	Total[1] Planned Miles	Miles[2] Scheduled in This Document	Road Classification (Miles)			Number Stream Crossing—AHMU		
				Arterial	*Collector*	*Local*	*Class 1*	*Class 2*	*Class 3*
742	.00	4.41	.31	.00	.31	.00	0	0	0
746	.00	87.09	38.48	11.39	10.11	16.98	10	6	19
747	5.02	90.57	25.83	3.05	8.49	14.29	4	4	21
748	29.90	80.90	.00	.00	.00	.00	0	0	0
753	.87	47.17	15.74	.00	5.27	10.47	6	5	0
	35.79	310.14	80.36	14.44	24.18	41.74	20	15	40

[1]Total planned miles is the total road system needed to access all acreage that would be available under this alternative. Available acreage does not include accessible acreage in old-growth habitat prescription, etc.

[2]Mileage totals may differ slightly from totals found in other tables due to rounding.

Alternative Development Guidelines

The following general direction was used by the ID Team in developing this alternative. The development guidelines are not necessarily the Standards and Guidelines to be used in implementation. For a complete listing of the Standards and Guidelines and Mitigation Measures used in implementation, please refer to section F of this chapter.

Visual/Recreation

Recreation development and management would take advantage of opportunities created by road construction and timber harvest. However, harvest units in most cases would not be located to retain or create recreation opportunities. A campground and boat ramp could be developed at North Saddle lake and a boat ramp and dock at Shelter Cove. A trail to South Saddle Lake could also be developed.

The mainline road would be designated to have harvest units on both sides of it. Some harvest units would be located adjacent to Carroll Inlet, Salt Creek, and Salt Lake.

Timber/Transportation

Cable logging systems, including skyline systems, with spans up to 2,000 feet would be used.

Harvest unit size would average approximately 75 acres.

Fish/Wildlife

Units would be designed to use streams as a yarding divide to prevent damage to stream-banks and to keep logging debris from entering streams.

Harvest along temperature sensitive streams would follow regional guidelines.

Establish and maintain a minimum 330 foot (100 meter) buffer around each eagle nest tree.

Soils/Water

All alternatives must be consistent with standards and guidelines established in TLMP.

High and very high mass movement index soils will be avoided, to the extent possible. (See Affected Environment Chapter 3 under Soils for more information on mass movement index in soils.)

State water quality standards will be met.

Executive Order 11990, as amended (42 U.S.C. 4321 et seq.), and as it pertains to modification or destruction of wetlands, will be met.

Executive Order 11988, as it pertains to floodplain development, will be met.

The National Forest Management Act (NFMA) 219.27 (12) (e), as it pertains to riparian habitat management, will be met.

Subsistence

Subsistence guidelines as outlined in Section 810 of ANILCA will be met.

Alternative 5—Emphasis on Forest-Interior Species

Description

The objective of this alternative is to minimize timber harvest activity in forest-interior species habitat. Emphasis would be given to maintenance of large old-growth blocks of timber and limiting road construction in these areas. This alternative provides for:

A. The harvest of 67.1 million board feet of timber in VCUs 746, 747 and 753, representing 2,581 acres.

B. The transfer to the water of all timber at the proposed Log Transfer Facility at Shelter Cove and at the Cape Fox facility at Hume Island.

C. The contribution of a yearly average of approximately 7 million board feet of timber to the Ketchikan economy.

D. The construction of 60.72 miles of new road during the planning period.

E. The average harvest unit size of 53.7 acres.

F. 100-foot buffer strips on all class I and II streams flowing directly into class I streams.

G. The maintenance of large old-growth blocks of timber for forest interior species.

This alternative emphasizes forest-interior wildlife species. Road construction would be located away form VCU 748.

Figure 2–4 in the Maps document displays where the harvest activities are proposed.

Table 2–11 displays in what VCUs timber harvest will occur, the amount of timber harvest scheduled during the next five years, the number of harvest units and volume class to be harvested in each VCU.

Table 2–11
Alternative 5: Proposed Timber Harvest by VCU

VCU	Total[1] Acres	Acres Scheduled	Volume[4] Scheduled	Number[3] of Units	Volume Class (Acres) 4	5	6	7
746[2]	14,406	1,019	25,767	22	262	757	0	0
747	16,737	835	23,772	14	236	565	34	0
753	9,303	727	17,562	13	377	350	0	0
		2,581	67,101					

[1]Will not agree with TLMP figures because of: (1) adjustment made to reflect changed State and Native selections; and (2) inclusion of all water bodies.

[2]Only part of the VCU is within the project area.

[3]Includes parts of units that may overlap with adjacent VCUs.

[4]Million board feet sawlog volume.

Table 2–12 displays the total acres and volume that will be harvested in this alternative by logging system.

Table 2–12
Alternative 5: Total Acres of Harvest by Logging System

Logging System	Acres	Volume (MMBF)
Highlead	816	21,655
Slackline	805	20,251
Live Skyline	98	2,482
Running Skyline	862	22,713
Standing Skyline	0	0
Helicopter	0	0
	2,581	67,101

Table 2–13 displays the miles of road scheduled during this planning period by VCU, by road classification, and by the number of stream crossing AHMU Classes.

Table 2–13
Alternative 5: Forest Development Road Status

VCU	Existing Miles	Total[1] Planned Miles	Miles[2] Scheduled in This Document	Road Classification (Miles) Arterial	Collector	Local	Number Stream Crossing—AHMU Class 1	Class 2	Class 3
742	.00	4.27	.00	.00	.00	.00	0	0	0
746	.00	83.29	26.66	4.60	7.16	14.90	10	3	4
747	5.02	86.93	16.69	4.53	2.10	10.06	1	2	7
748	29.90	80.90	.00	.00	.00	.00	0	0	0
753	.87	47.73	17.37	.00	5.07	12.30	6	3	3
	35.79	303.12	60.72	9.13	14.33	37.26	17	8	14

[1]Total planned miles is the total road system needed to access all acreage that would be available under this alternative. Available acreage does not include accessible acreage in old-growth habitat prescription, etc.

[2]Mileage totals may differ slightly from totals found in other tables due to rounding.

Alternative Development Guidelines

The following general direction was used by the ID Team in developing this alternative. The development guidelines are not necessarily the Standards and Guidelines used in implementation. For a complete listing of the Standards and Guidelines and Mitigation measures to be used in implementation, please refer to Section E. of this chapter.

Visual/Recreation

Roaded recreation would not be emphasized. The proposed road system could in the the future serve the development of a campground and boat ramp at North Saddle Lake and a boat ramp and dock at Shelter Cove. A trail to South Saddle Lake could also be planned.

The mainline road would be designed to limit cutting to one side of the road. The harvest units would be located away from lakes.

Timber/Transportation

Roads would be located at least 0.5 miles from Salt Lagoon.

Harvest units would be located on the perimeter of old-growth habitat blocks.

At least 25 percent of harvest acres would be scheduled in volume class 4 stands.

Fish/Wildlife

Unit selection and road building would not be located adjacent to Salt Creek.

Establish and maintain a minimum 330 foot (100 meter) buffer zone around each eagle nest tree.

Minimize timber harvest in deer winter range.

No harvest would occur within existing old-growth prescription areas. (For an explanation of old-growth prescription, please refer to Chapter 4 of this document under Wildlife.)

Protect Aquatic Habitat Management Units.

Establish large blocks of old-growth timber, approximately 1,000 acres in size, for forest-interior species.

Limit road construction away from VCU 748.

Soils/Hydrology

All alternatives must be consistent with standards and guidelines established in TLMP.

High and very high mass movement index soils will be avoided, to the extent possible.

State water quality standards will be met.

Executive Order 11990, as amended (42 U.S.C. 4321 et seq.), and as it pertains to modification or destruction of wetlands, will be met.

Executive Order 11988, as it pertains to floodplain development, will be met.

The National Forest Management Act (NFMA) 219.27 (12) (e), as it pertains to riparian habitat management, will be met.

Subsistence

Subsistence guidelines as outlined in Section 810 of ANILCA will be met.

Alternative 6—Recreation/Timber Emphasis

Description

This alternative retains the dispersion pattern of harvest units, which emphasizes recreation and visual resources, while increasing the timber harvest to improve timber sale economics. This alternative provides for:

A. The harvest of 82.1 million board feet of timber in VCUs 746, 747, 748, and 753 representing 3,060 acres.

B. The transfer to the water of 70.2 million board feet of timber to the proposed Log Transfer Facility at Shelter Cove and the transfer to the water of 11.9 million board feet of timber using Cape Fox's facilities at Hume Island.

C. The contribution of a yearly average of 8.2 million board feet of timber to the Ketchikan economy.

D. The construction of 70.96 miles of new road.

E. The average harvest unit size of 51.9 acres.

G. 100-foot buffer strips on all class I and II streams flowing directly into class I streams.

Figure 2-5 in the Maps document displays where the harvest activities are proposed.

Table 2-14 displays in what VCUs timber harvest will occur, the amount of timber harvest scheduled during the next five years, the number of harvest units and volume class to be harvested in each VCU.

Table 2-14

Alternative 6: Proposed Timber Harvest by VCU

VCU	Total[1] Acres	Acres Scheduled	Volume[4] Scheduled	Number[3] of Units	Volume Class (Acres) 4	5	6	7
746[2]	14,406	865	22,356	17	294	538	33	0
747	16,737	1,684	46,870	34	407	1,086	187	5
748	19,937	79	2,847	2	21	22		36
753	9,303	432	10,050	7	268	164		0
		3,060	82,123					

[1]Will not agree with TLMP figures because of: (1) adjustment made to reflect changed State and Native selections; and (2) inclusion of all water bodies.

[2]Only part of the VCU is within the project area.

[3]Includes parts of units that may overlap with adjacent VCUs.

[4]Million board feet sawlog volume.

Table 2-15 displays the total acres and volume that will be harvested in this alternative by logging system.

Table 2-15

Alternative 6: Total Acres of Harvest by Logging System

Logging System	Acres	Volume (MMBF)
Highlead	1,034	28,623
Slackline	1,104	30,038
Live Skyline	127	3,223
Running Skyline	787	19,988
Standing Skyline	8	251
Helicopter	0	0
	3,060	82,123

Table 2-16 displays the miles of road scheduled during this planning period by VCU, by road classification, and by number of stream crossing AHMU Classes.

Table 2-16
Alternative 6: Forest Development Road Status

VCU	Existing Miles	Total[1] Planned Miles	Miles[2] Scheduled in This Document	Road Classification (Miles) *Arterial*	*Collector*	*Local*	Number Stream Crossing—AHMU *Class 1*	*Class 2*	*Class 3*
742	.00	4.26	1.81	.00	.88	.93	0	0	1
746	.00	85.70	23.07	4.60	6.50	11.97	8	4	2
747	5.02	89.83	35.30	10.63	7.38	17.29	5	2	31
748	29.90	81.60	.70	.00	.00	.70	0	0	0
753	.87	46.91	10.08	.00	5.91	4.17	2	1	3
	35.79	308.30	70.96	15.23	20.67	35.06	15	7	37

[1]Total planned miles is the total road system needed to access all acreage that would be available under this alternative. Available acreage does not include accessible acreage in old-growth habitat prescription, etc.

[2]Mileage totals may differ slightly from totals found in other tables due to rounding.

Alternative Development Guidelines

The following general direction was used by the ID Team in developing this alternative. The development guidelines are not necessarily the Standards and Guidelines to be used in implementation. For a complete listing of the Standards and Guidelines and Mitigation measures used in implementation, please refer to Section F of this chapter.

Visual/Recreation

Recreation development and management would be emphasized by increasing access by roads and limiting timber harvest units to outside of lake areas. Trails could be developed to Sale Creek, Salt Lake and South Saddle Lake. A campground and boat ramp could be developed at North Saddle Lake and a boat ramp and dock at Shelter Cove.

The mainline road would be designed to have a few areas where cutting occurs on both sides of the road; however, most units would be on only one side of the road. Some units would be located along the Carroll Inlet travel route. Harvest units would not be located next to recreation lakes, however, some will be adjacent to streams.

Timber/Transportation

Roads would be located at least 0.5 miles away from Salt Lagoon and beach along George Inlet.

Harvest units would be dispersed to emphasize visual management.

At least 25 percent of harvest acres would be scheduled in volume class 4 stands.

Fish/Wildlife

Harvest units would be limited along lower Salt Creek.

Harvest units would not be located immediately above Salt Lake.

Establish and maintain a minimum 330 foot (100 meter) buffer zone around each eagle nest tree.

Harvest within existing old-growth prescription areas would be minimized.

Aquatic Habitat Management Units would be protected.

Soils/Hydrology

All alternatives must be consistent with standards and guidelines established in TLMP.

High and very high mass movement index soils will be avoided, to the extent possible.

State water quality standards will be met.

Executive Order 11990, as amended (42 U.S.C. 4321 et seq.), and as it pertains to modification or destruction of wetlands, will be met.

Executive Order 11988, as it pertains to floodplain development, will be met.

The National Forest Management Act (NFMA) 219.27 (12) (e), as it pertains to riparian habitat management, will be met.

Subsistence

Subsistence guidelines as outlined in Section 810 of ANILCA will be met.

Comparison of the Alternatives

This section displays how each alternative considered addresses the issues listed in Chapter 1.

Issue 1: Effects of Timber Harvest on Visual/Recreation Resources

Visual Resource

Alternative 1

No reductions in the visual quality of potentially affected viewsheds will occur. In places such as Salt Lagoon and the Carroll Inlet shoreline around Shelter Cove, old harvest areas will continue to regenerate and would eventually retain a partial retention visual condition.

Alternative 2

Extensive impacts are immediately along the potential main road corridor. Major additional visual impacts are in Salt Lagoon and North Saddle Lakes areas, and at the head of Salt Lake valley. Moderate additional impacts are around Shelter Cove. No additional impacts are north and south of Shelter Cove along Carroll Inlet. Extensive impacts are around Leask Cove, part of an area seen from Heckman Lake and from Leask Lake.

Alternative 3

Moderate impacts are immediately along the potential main road corridor. Light to moderate impacts are in Salt Lagoon and North Saddle Lakes areas that are close to meeting inventoried visual quality objectives. Major impacts at head of Salt Lake that meet only maximum modification visual objective. Moderate additional impacts are around Shelter Cove and no additional impacts are north and south of Shelter Cove along Carroll Inlet. Extensive impact are in portions of Leask Cove and Leask Lake viewsheds. No impact from within the Naha area.

Alternative 4

Extensive impacts are immediately along the potential main road corridor. Very extensive impacts are around Salt Lagoon and along much of Carroll Inlet. Extensive impacts are in North Saddle Lakes area similar to Alternative 2. Very extensive impacts are all around the Salt Lake basin. No additional impacts around Leask Cove and Leask Lake or Naha area.

Alternative 5

No major arterial is proposed around Salt Lagoon as in other alternatives. Slight additional impact from Salt Lagoon that is close to meeting inventoried visual quality objectives. Virtually no impacts occur from North Saddle Lakes or Salt Lake. Moderate impacts at head of Salt Lake due to one harvest unit. There are no additional impacts in Leask Cove, Leask Lake, and the Naha areas. There are moderate impacts along Carroll Inlet south of Shelter Cove.

Alternative 6
Moderate impacts are immediately along the potential main road corridor. Moderate impacts will occur around Salt Lagoon, North Saddle Lakes, and around Shelter Cove. Moderate to extensive impacts will occur south of Shelter Cove along Carroll Inlet. Extensive impacts will occur around portions of Leask Cove, Leask Lake, and head of Salt Lake basin. Very slight impacts are expected from a portion of Heckman Lake.

Recreation Resources

The following is a brief comparison, by alternative, of the effects timber harvesting will have on the recreation resources of the Shelter Cove project area. The Recreation Opportunity Spectrum (ROS) provides a framework for classifying recreation opportunities available in a geographic area. Changes in the acreage of each ROS class are the result of roading and harvesting. These changes provide an indication of the effects each alternative would have on the recreation opportunities and settings of the project area. Following is a list of the ROS categories and associated abbreviations used in the comparison tables.

P1	-Primitive 1
P2	-Primitive 2
SPNM	-Semi-Primitive Non-Motorized
SPM	-Semi-Primitive Motorized
RN	-Roaded Natural
RM	-Roaded Modified
R	-Rural
U	-Urban

Alternative 1—No Action Alternative
Under this alternative no new activities would be scheduled during the 1991-95 period in the Shelter Cove and George Inlet area.

Table 2-17
Alternative 1 ROS Classes

	ROS Classes					
Alternative	*P1*	*P2*	*SPNM*	*SPM*	*RN*	*RM*
1	4,662	696	36,217	2,200	1,626	14,977

Alternative 2
Alternative 2 would result in the greatest shift from Primitive recreation experiences toward roaded recreation experiences as shown by Table 2-18.

Table 2-18
Alternative 2 ROS Classes

	ROS Classes					
Alternative	*P1*	*P2*	*SPNM*	*SPM*	*RN*	*RM*
1	4,662	696	36,217	2,200	1,626	14,977
2	1,968	55	31,575	2,200	2,542	22,038

Potential Recreation Opportunities:

a. Development of a trailhead and trail from upper Salt Creek to the Naha Area around Salt Lake and/or a fishing access trail along Salt Creek.

b. Development of an access trail across State Land to Salt Lagoon along with dispersed camping around the lagoon.

c. Development of campgrounds, day use areas, dispersed camp sites and/or loop trails around North Saddle Lakes.

d. Development of an access trail into the large South Saddle Lake and development of a recreation cabin, three-sided shelter or dispersed camp sites.

e. Development of a boat ramp and dock in Shelter Cove.

Alternative 3

Alternative 3 would result in a shift from Primitive recreation experiences toward roaded recreation experiences as shown by the following table.

Table 2-19
Alternative 3 ROS Classes

	ROS Classes					
Alternative	*P1*	*P2*	*SPNM*	*SPM*	*RN*	*RM*
1	4,662	696	36,217	2,200	1,626	14,977
3	2,358	105	28,992	2,200	2,132	24,591

Potential Recreation Opportunities:

a. Development of a trailhead and trail from upper Salt Creek to the Naha Area around Salt Lake and/or a fishing access trail along Salt Creek.

b. Development of an access trail across State Land to Salt Lagoon along with dispersed camping around the lagoon.

c. Development of campgrounds, day use areas, dispersed camp sites and/or loop trails around North Saddle Lakes.

d. Development of an access trail into the large South Saddle Lake and development of a recreation cabin, three-sided shelter or dispersed camp sites.

e. Development of a boat ramp and dock in Shelter Cove.

Alternative 4

Alternative 4 would result in a shift from Primitive recreation experiences toward roaded recreation experiences as shown by the following table.

Table 2-20
Alternative 4 ROS Classes

	ROS Classes					
Alternative	*P1*	*P2*	*SPNM*	*SPM*	*RN*	*RM*
1	4,662	696	36,217	2,200	1,626	14,977
4	2,344	105	26,066	2,200	3,514	26,149

Potential Recreation Opportunities:

a. Development of a trailhead and trail from upper Salt Creek to the Naha Area around Salt Lake and/or a fishing access trail along Salt Creek.

b. Development of an access trail across State Land to Salt Lagoon along with dispersed camping around the lagoon.

c. Development of campgrounds, day use areas, dispersed camp sites and/or loop trails around North Saddle Lakes.

d. Development of an access trail into the large South Saddle Lake and development of a recreation cabin, three-sided shelter or dispersed camp sites.

e. Development of a boat ramp and dock in Shelter Cove.

Alternative 5—Emphasis on Forest-Interior Species

Alternative 5 would result in the smallest shift from Primitive recreation experiences toward roaded recreation experiences as shown by Table 2-21.

Table 2-21
Alternative 5 ROS Classes

Alternative	ROS Classes *P1*	*P2*	*SPNM*	*SPM*	*RN*	*RM*
1	4,662	696	36,217	2,200	1,626	14,977
5	3,763	696	25,365	2,200	2,364	25,990

Potential Recreation Opportunities:

a. Development of an access trail across State Land to Salt Lagoon along with dispersed camping around the lagoon.

b. Development of campgrounds, day use areas, dispersed camp sites and/or loop trails around North Saddle Lakes.

c. Development of an access trail into the large South Saddle Lake and development of a recreation cabin, three-sided shelter or dispersed camp sites.

e. Development of a boat ramp and dock in Shelter Cove.

Alternative 6

Alternative 6 would result in a shift from Primitive recreation experiences toward roaded recreation experiences as shown by the following table.

Table 2-22
Alternative 6 ROS Classes

Alternative	ROS Classes *P1*	*P2*	*SPNM*	*SPM*	*RN*	*RM*
1	4,662	696	36,217	2,200	1,626	14,977
6	2,146	105	25,924	2,200	2,618	27,385

Potential Recreation Opportunities:

a. Alternative 6 provides the opportunity to develop a recreation cabin on Salt Lake accessible to people with special needs. The road proposed for this alternative is close enough to provide access within a mile of a cabin.

b. Development of a trailhead and trail from upper Salt Creek to the Naha Area around Salt Lake and/or a fishing access trail along Salt Creek.

c. Development of an access trail across State Land to Salt Lagoon along with dispersed camping around the lagoon.

d. Development of campgrounds, day use areas, dispersed camp sites and/or loop trails around North Saddle Lakes.

e. Development of an access trail into the large South Saddle Lake and development of a recreation cabin, three-sided shelter or dispersed camp sites.

f. Development of a boat ramp and dock in Shelter Cove.

Issue 2: Timber Sale Economics

A financial analysis was performed on each alternative which schedules timber for harvest. Table 2-23 compares the economics of timber harvest in dollars/thousand board feet of timber ($/MBF) for each alternative under mid-market conditions. (The mid-market is the value and product mix where one half of the timber has been harvested at higher values and product mix and one half of the timber has been harvested at lower values and product mix, during the period from 1979 to the current quarter.) The mid-market conversion expresses the net dollar value of the timber volume after subtracting the production costs from the mid market log value. The table also displays road and log transfer facility (LTF) construction costs in terms of millions of dollars (MM$).

Table 2-23
Timber Harvest Economics

	Alternative					
Components	*1*	*2*	*3*	*4*	*5*	*6*
Mid-Market Conversion Rate $/MBF	0	9.0	3.1	-17.0	-11.4	-12.9
Road Construction Costs, LTFs (MM$)	0	9.2	10.0	14.3	10.9	13.4

The following table displays the projected impact to the community of Ketchikan in terms of direct and indirect private-sector jobs and wages paid in millions of dollars over a 5-year period. It is assumed that 8.5 jobs are created per million feet of timber harvested.

Table 2-24
Economic Impact in Terms of Jobs and Projected Income

	Alternative					
Components	*1*	*2*	*3*	*4*	*5*	*6*
Jobs Created	0	54	53	81	57	70
Wages Paid (MM$)	0	2.3	2.3	3.4	2.4	3.0

Issue 3: Effects of Timber Harvest on Fish Habitat

The Standards and guidelines applied to harvest units and road construction are designed to prevent degradation of fish habitat and fish capability. Effective and consistent application of these measures will prevent any significant reduction in fish habitat capability. The alternatives will be compared by the amount of harvest adjacent to high value fish habitat, whether harvest units are planned on sensitive soil types above quality spawning habitat (primarily upper Salt Creek) and whether fish enhancement projects would be access by the road system and could be funded by collected timber sale receipt (K-V) dollars.

Alternative 1
The no action alternative would have no new harvest and, therefore, no environmental consequences to fisheries habitat and capability. There would be no new roading in the Aquatic Habitat Management Unit (AHMU) or stream crossings associated with it.

Alternative 2
Road construction provides close access to both the Salt Creek and Nigleus Creek potential fishpass projects, and could be funded through Knudsen-Vanderberg funds collected from timber sales. Units are located next to lower Salt Creek and in the case of Units 747-15 and 18, cut on both sides of the Salt Creek AHMU, in its most productive section.

Nine units harvest timber from sensitive soil areas, above the coho spawning area, above Salt Lake. Coho production potential of the planning area is slightly reduced from harvest and road operations. A very slight loss of coho production would occur from stream crossing road structures. These would be compensated by the Nigelius fish passage, if constructed.

Alternative 3
Road construction also provides close access to both potential fishpass projects. There are four units on the sensitive soil areas above Salt Creek coho spawning area. The lower portion (C3 high value habitat) does not have harvest units adjacent, so less potential exists for blowdown AHMU buffers. The coho production potential is slightly reduced from road operations. Coho lost could be mitigated through construction of the Nigelius fishway.

Alternative 4
Road construction provides close access to the potential fishpass sites for cost effective enhancement. Six units are located on the steep sensitive soil areas above the Salt Lake coho spawning areas. Four large units adjacent to Salt Creek are located adjacent to production habitat along lower Salt Creek. The floodplain areas adjacent to Unit 747–47 could be prone to windthrow, and should have higher concentrations of small unmapped side channels. A very small loss of coho and pink production is expected from stream crossing structures associated with road building.

Alternative 5
The road construction provides close road access to the potential Nigelius Creek fishway. The Salt Creek fishway would lay outside of the K-V collection boundary. Management activities have been deferred from most of the Salt Creek area, and does not harvest adjacent to the productive fish habitat in lower Salt Creek, and the sensitive soil areas above Salt Lake spawning areas. A very small loss of coho and pink production is expected from stream crossing structures associated with road building. Again, construction of the Nigelius Creek fishway would mitigate any coho loss. Since no road access into Salt Creek is built, potential overharvest of Salt Creek coho stock is lessened.

Alternative 6
Harvest unit and road location allows for more cost effective fishway development in Salt Creek. The potential fishway site would be in the KV collection boundary. The alternative has five units with hazard soil areas above productive salmon habitat of upper Salt Creek. The five units located adjacent to lower Salt Creek, particularly Units 747–43 and 47, cause particular concern, since they harvest several hundred feet adjacent to the large floodplain management unit. This sets up a greater chance for blowdown.

Issue 4: Effects of Timber Harvest on Wildlife Habitat

Alternative 2
This alternative proposes 2566 acres of wildlife old-growth prescription in effective blocks. Acres of remaining habitat for Management Indicator Species (MIS) are as follows: Sitka black-tailed deer (less than 800 feet in elevation) 14539, pine marten 23464, black bear 2241, bald eagle 2006, river otter 2149, hairy woodpecker 27322, and Vancouver Canada goose 1356. Rough population estimates habitat capabilities for the MIS are as follows: Sitka black-tailed deer (less than 800 feet in elevation) 1408, pine marten 43, black bear 79, bald eagle 73, river otter 11, and hairy woodpecker 288.

Alternative 3
This alternative proposes 3767 acres of wildlife old-growth prescription in effective blocks. Acres of remaining habitat for MIS are as follows: Sitka black-tailed deer (less than 800 feet in elevation) 14594, pine marten 23407, black bear 2251, bald eagle 2016, river otter 2159, hairy woodpecker 27307, and Vancouver Canada goose 1368. Rough population estimates habitat capabilities for the MIS are as follows: Sitka black-tailed deer 1523, pine marten 57, black bear 82, bald eagle 73, river otter 11, and hairy woodpecker 344.

Alternative 4

This alternative proposes 2864 acres of wildlife old-growth prescription in effective blocks. Acres of remaining habitat for MIS are as follows: Sitka black-tailed deer (less than 800 feet in elevation) 13017, pine marten 22035, black bear 2162, bald eagle 1945, river otter 2088, hairy woodpecker 25870, and Vancouver Canada goose 1334. Rough population estimates habitat capabilities for the MIS are as follows: Sitka black-tailed deer 1280, pine marten 39, black bear 79, bald eagle 70, river otter 11, and hairy woodpecker 303.

Alternative 5

This alternative proposes 5805 acres of wildlife old-growth prescription in effective blocks. Acres of remaining habitat for MIS are as follows: Sitka black-tailed deer (less than 800 feet in elevation) 13980, pine marten 23058, black bear 2241, bald eagle 2006, river otter 2149, hairy woodpecker 26909, and Vancouver Canada goose 1356. Rough population estimates habitat capabilities for the MIS are as follows: Sitka black-tailed deer 1567, pine marten 64, black bear 86, bald eagle 73, river otter 11, and hairy woodpecker 406.

Alternative 6

This alternative proposes 3006 acres of wildlife old-growth prescription in effective blocks. Acres of remaining habitat for MIS are as follows: Sitka black-tailed deer (less than 800 feet in elevation) 13635, pine marten 22578, black bear 2242, bald eagle 2007, river otter 2150, hairy woodpecker 26425, and Vancouver Canada goose 1357. Rough population estimates habitat capabilities for the MIS are as follows: Sitka black-tailed deer 1400, pine marten 50, black bear 80, bald eagle 73, river otter 11, and hairy woodpecker 298.

Issue 5: Effects of Timber Harvest on Soils and Water

Issues identified in scoping for watershed management were soil mass movement and water quality.

Proper timber harvest planning and administration, in addition to application of Standards and Guidelines and Mitigation Measures, can minimize soil disturbance and subsequent erosion. Roads and landslides contribute most to sedimentation and subsequent water quality alterations. Potentially unstable soils were identified using a mass movement index rating system. This information provides managers with knowledge of where mitigation measures may need to be applied to minimize possible adverse effects of timber harvest and road construction on soil productivity and water quality. Acres of harvest on high and very high mass movement index soils (MMI) compares the amount of harvest on soils most sensitive to disturbance and erosion. Alternative 6 proposes the most acres of harvest on high MMI soils (1,333 acres), followed by Alternatives 4, 5, 3, and 2, with 1325, 1161, 981, and 814 acres, respectively. Alternative 4 proposes the most harvest acres on very high MMI soils (210 acres), followed by Alternatives 5, 3, 2, and 6, respectively (33, 32, 24, and <1 acre).

Road building activities are the major causes of harvest-related mass movement events and the major contributors of harvest-related sediment. Minimizing road building activities on unstable soils will lessen the possibility of mass movement events and associated impacts. Alternative 4 proposes building 20.0 miles of road on high MMI soils, followed by Alternatives 6, 5, 3, and 2, respectively (15.2, 14.2, 11.8, and 9.6 miles). Alternative 4 also proposes building 5.0 miles of road over very high MMI soils, followed by Alternatives 3, 5, 2, and 6, respectively (1.2, 0.12, 0.5, and 0.4 miles).

The total amount of disturbance on high and very high MMI soils can be determined by adding disturbance created from road construction and amount of disturbance created during falling, yarding, and timber harvest activities. A greater amount of disturbance on high and very high MMI soils will likely result in greater mass movement incidents compared to low or moderate MMI soils. Alternative 4 is estimated to create the highest total

area disturbed (302.9 acres), followed by Alternatives 6, 5, 3, and 2, respectively (238.7, 221.8, 188.1, and 150.8 acres).

Frequency of wetlands in the project area precludes avoidance when implementing harvest and road building activities. Approximately 52 percent of the project area are classified as wetlands. Alternative 4 proposes to harvest the most forested wetland acres (1182 acres), followed by Alternatives 5, 6, 3, and 2, respectively (1041, 857, 457, and 318 acres).

New construction in wetlands will be limited to roads, landings and associated drainage structures. Impacts from roads are limited to the wetlands directly underlying the road prism and associated cuts and fills. Alternative 4 impacts the most wetland acres (307 acres) with road construction, followed by Alternatives 5, 6, 3, and 2 with 264, 250, 201, and 148 acres, respectively. Six-tenths of one acre of estuary may be impacted by road construction in Alternative 4. Estuaries in all other alternatives will not be impacted by road construction.

Each action alternative, except Alternative 5, proposes roading through VCU 742, which is LUD II designation. The proposed roads will have little impact on wetlands or unstable soils. Alternative 6 proposes to impact approximately 3.4 acres of land through soils having high MMI. Alternatives 2 and 3 will impact 1.2 acres each, followed by Alternatives 4 and 5 which will have no impact on high MMI soils. Zero acres of land will be impacted by road construction on very high MMI soils for any alternative. Approximately 3.4 acres of wetlands will be altered due to road construction in VCU 742 in Alternatives 2 and 3 only, while all other alternatives will have no impacts on wetlands.

The total impact roads will have on VCU 742 will be removal of approximately 12 acres of land from production, which equates to approximately 0.04 percent of the entire VCU.

Issue 6: Protection of Subsistence Use Areas

Table 2-25 displays the amount of timber scheduled for harvest within areas of concentrated subsistence use. The project area contains about 19,285 acres of operable timber of which 885 acres are old-growth beach fringe which is the concentrated use area.

Table 2-25
Timber Scheduled for Harvest in Area of Concentrated Subsistence Use (Acres)

Alternative	Acres Scheduled
1	0
2	0
3	2
4	57
5	0
6	0

Table 2-26 displays the number of deer the habitat in the project area can support now and in the year 2000 by alternative and the number of deer needed to meet current demand.

Table 2-26
Deer Harvest and Habitat Capability for the Shelter Cove Project Area

Alternative	No. of Deer that Habitat Can Support in Year 1990	No. of Deer that Habitat Can Support in Year 2000	Population of Deer Needed to Meet Demand 1990
1	1,807	1,804	1,380
2	1,807	1,408	1,380
3	1,807	1,523	1,380
4	1,807	1,280	1,380
5	1,807	1,567	1,380
6	1,807	1,400	1,380

None of the alternatives are expected to cause a restriction of subsistence hunting or fishing.

Table 2-27 compares the alternatives by issue in matrix form.

Table 2-27
Comparison of Alternatives

Alternative	Effects of Timber Harvest on Visual Resources	Effects of Timber Harvest on Recreation Resources	Timber Sale Economics	Effects of Timber Harvest on Fish Habitat
Alt. 1	No resource impacts.	No resource impacts.	No resource impacts.	No resource impacts.
Alt. 2	Major visual impacts in Salt Lagoon and North Saddle Lakes. Moderate impact to Shelter Cove. No additional impacts N and S of Shelter Cove along Carroll Inlet. Extensive impact around Leask Cove.	Recreation setting shifts the greatest from primitive towards roaded recreation.	63.9 MMBF are scheduled for harvest, creating approximately 54 direct and indirect jobs. Wages paid are projected at 2.3 million dollars over a 5-year period. This alt. expresses a positive conversion rate.	Landslide potential in Units 35 through 39. Concentration of units in valuable Salt Cr. habitat. Blowdown potential in Units 15, 18, harvest on both sides of stream. Good fish enhancement access.
Alt. 3	Light/moderate impacts in Salt Lagoon and North Saddle Lakes. No additional impacts N and S of Shelter Cove along Carroll Inlet. Extensive impacts to portions of Leask Lake viewshed.	Recreation setting and associated opportunities shift from primitive towards roaded.	61.8 MMBF scheduled. Creation of approximately 54 jobs. 2.3 million dollars in wages paid. A positive conversion rate is projected.	Less concentration of units in Salt Cr. Few erosion problems. Blowdown potential in lower Salt Cr. Good fish enhancement access.
Alt. 4	Extensive impacts around Salt Lagoon, Carroll Inlet, N Saddle Lakes, and Salt Lake basin. No additional impacts around Leask Cove and Leask Lake.	Same as Alternative 3.	95.6 MMBF scheduled. Creation of approximately 81 jobs. 3.4 million dollars in wages paid. A negative conversion rate is projected.	Large harvest adjacent to lower Salt Cr. Some units in spawning area above Salt Lake. Good fish enhancement access. Blowdown potential.
Alt. 5	Slight impact to Salt Lagoon and Salt Lake areas. No impacts from N Saddle Lakes. No impact in Leask Cove and Lake. Moderate impacts to Carroll Inlet and Shelter Cove.	Impacts the least amount of primitive recreation. Most activities far enough away from Naha to retain its current opportunities.	67.1 MMBF scheduled. Creation of approximately 57 jobs. 2.4 million dollars in wages paid. A negative conversion rate is projected.	No stream crossing in lower Salt Cr. Low erosion potential on steep slopes. No potential effects on Salt Cr. coho population. Limited fish enhancement.
Alt. 6	Moderate impacts to Salt Lagoon, N Saddle Lakes, and Shelter Cove. Moderate/extensive impacts on portions of Leask Cove, Leask Lake, and Salt Lake Basin.	Same as Alternative 3.	82.1 MMBF scheduled. Creation of approximately 70 jobs. 3.0 million dollars in wages paid. A negative conversion rate is projected.	Moderate harvest in lower Salt Cr. Less blowdown potential than Alt. 2-4. Erosion potential in Units 25-27. Major stream crossing on lower Salt Cr. Good fish enhancement access.

Table 2-27 (Continued)
Comparison of Alternatives

Alternative	Effects of Timber Harvest on Wildlife Resources	Effects of Timber Harvest on Soils and Water	Protection of Subsistence Use Areas
Alt. 1	No resource impacts.	No resource impacts.	No resource impacts.
Alt. 2	2566 ac. effective block old-growth prescription Breakdown of ac. and pop. est. as follows: Deer 14539 (1408), Marten 23464 (43), Bear 2241 (79), Eagle 2006 (73), Otter 2149 (11), Woodpecker 27322 (288), Goose 1356.	838 harvest acres having high or very high Mass Movement Index (MMI). 10.1 miles of proposed road on high or very high MMI soils. 539 acres of wetlands affected.	No significant possibility of a significant restriction of subsistence use.
Alt. 3	3767 ac. effective block. Breakdown of ac. and pop. Deer 14594 (1523), Marten 23407 (57), Bear 2251 (82), Eagle 2016 (73), Otter 2159 (11), Woodpecker 27307 (344), Goose 1368.	1013 harvest acres having high or very high MMI. 13.1 miles of proposed road on high or very high MMI. 748 acres of wetlands affected.	No significant possibility of a significant restriction of subsistence use.
Alt. 4	2864 effective ac. Breakdown. Deer 13017 (1280), Marten 22035 (39), Bear 2162 (79), Eagle 1945 (70) Otter 2088 (11), Woodpecker 25870 (303), Goose 1334.	1536 harvest acres having high or very high MMI. 25.0 miles of proposed road on high or very high MMI. 1600 acres of wetlands affected.	No significant possibility of a significant restriction of subsistence use.
Alt. 5	5805 effective ac. Breakdown. Deer 13980 (1567), Marten 23058 (64), Bear 2241 (86), Eagle 2006 (73) Otter 2149 (11), Woodpecker 26909 (406), Goose 1356.	1194 harvest acres having high or very high MMI. 15.4 miles of proposed road on high or very high MMI. 1372 acres of wetlands affected.	No significant possibility of a significant restriction of subsistence use.
Alt. 6	3006 effective ac. Breakdown. Deer 13635 (1400), Marten 22578 (50), Bear 2242 (80), Eagle 2007 (73) Otter 2150 (11), Woodpecker 26425 (298), Goose 1357.	1333 harvest acres having high or very high MMI. 15.6 miles of proposed road on high or very high MMI. 1192 acres of wetlands affected.	No significant possibility of a significant restriction of subsistence use.

Standards and Guidelines and Mitigation Measures

Standards and guidelines define the methods and expected results for implementation of the proposed project. A standard or a guideline is a statement of policy or procedure establishing the agency's purpose and objective for specific aspects of implementation. The standards and guidelines contained in this document are based on previously established standards and guidelines in the Alaska Regional Guide and Forest Service Manual and Handbooks which provide additional policy and procedural direction. Through interdisciplinary processes, the ID Team has applied the standards and guidelines to address specific conditions and objectives.

The mitigation measures identified during this planning process are to be used during implementation of any action alternative to ensure that the objectives of the standards and guidelines are met. The mitigation measures may be further refined as the project develops to respond to changed conditions, more detailed design and layout information, or monitoring results.

Table 2-28 is organized in matrix format with an individual resource mitigation focus. Each resource discusses: (1) the resource management objectives, (2) proposed actions to meet the objective, and (3) where the objectives and actions are being applied.

Specific mitigation measures for each alternative, by harvest unit, are listed in Appendix B of this document.

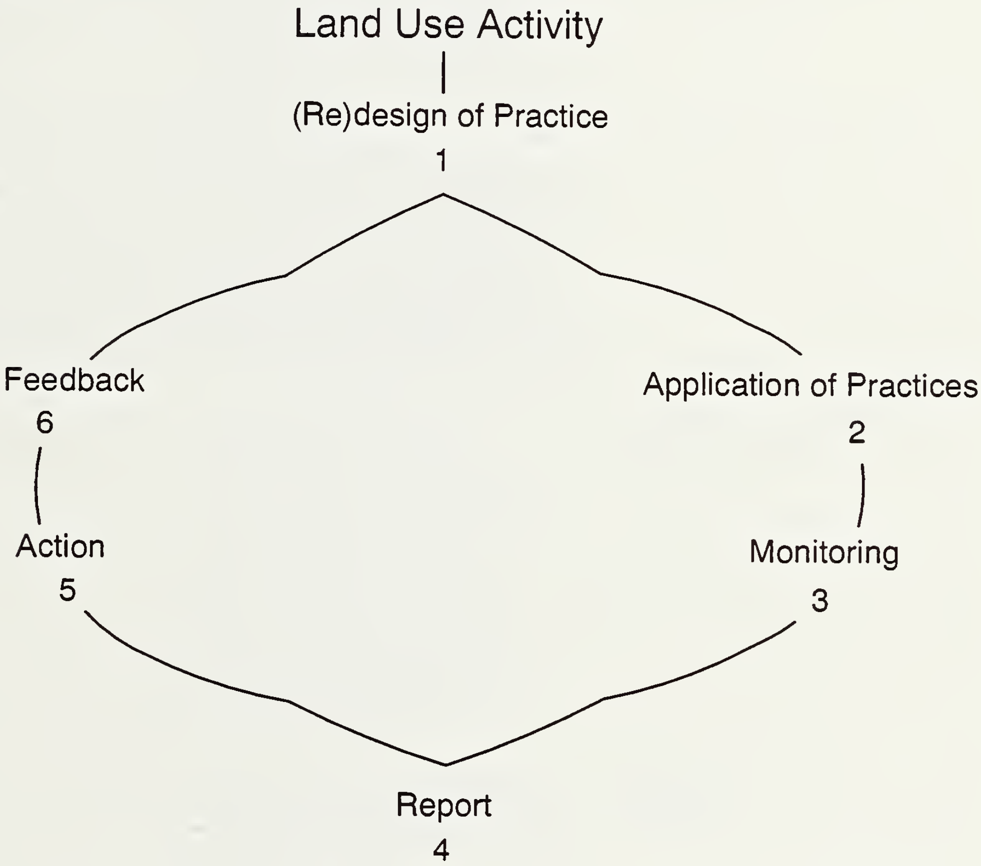
During land management activities it is necessary to protect and maintain water quality and minimize nonpoint source pollution to the extent practical. During land management practices Best Management Practices (BMPs) are recognized as the primary mechanism to enable the achievement of water quality standards. It is intended that proper installation of State approved BMPs will achieve water quality standards. Also for proposed management actions, BMPs designed and implemented in accordance with a State approved process will normally constitute compliance with the Clean Water Act (CWA). BMPs developed under a State approved process may be used as performance standards for proposed actions. Applicable water quality standards along with water quality monitoring should be used to measure the effectiveness of BMPs. Therefore, State water quality standards will be used to measure the effectiveness of BMPs.

To comply with State water quality standards, the Forest Service is required to apply BMPs that are "consistent" with State Forest Practices and other applicable State water quality regulations in Alaska, in order to minimize the adverse effects of management activities on the soil and water resources, and to protect water-related beneficial uses. Practices (BMPs) described in the Forest Service's R-10 Soil and Water Conservation Handbook (FSH 2509.22), Chapter 10, will be the primary mechanism used for accomplishing minimum adverse effects of management activities to protect quality standards during the Shelter Cove implementation process. This handbook describes the application, monitoring, evaluation, and possible refinement of these Practices (BMPs). The Practices (BMPs) have been identified in Table 2-28 of the Shelter Cover Environmental Impact Statement (SCEIS) as part of the Soil and Watershed Mitigation Measures. Practices (BMPs) in the FSH meet the criteria as BMPs but have not been certified at this time by the State. They do, however, represent the state-of-the-art application for nonpoint source pollution control. Proper installation, operation, and maintenance of these Practices (BMPs) will be used to meet the obligation for compliance with applicable State Water Quality Standards.

If subsequent monitoring indicates that the properly installed Practices are not achieving State Water Quality Standards, the Forest Service will immediately initiate mitigation measures, through the IDT process, to insure achievement of compliance of water quality

standards. It is the Forest Service and State's cooperative responsibility to take steps to (1) revise non-achieving water quality standards, Practices, or BMPs; (2) evaluate and, if appropriate, revise water quality standards (designated beneficial uses and water quality criteria); or (3) both steps 1 and 2. The Forest Service will begin implementing immediately any Practices (BMPs) that are revised during the sale period.

It is important to have an iterative process to enable to determine if a Practice or BMP functions as designed and to revise it if necessary. Through the use of the following iterative process of monitoring and adjustment of BMPs and/or water quality standards, it is anticipated and expected that BMPs will lead to achievement of water quality standards.



The State Water Quality Standards will be used to measure the effectiveness of the Practices (BMPs) during the monitoring part of the iterative process. The water quality standards to be measured during management activities include (1) sediment (ppm); (2) water temperature (°C); and (3) dissolved oxygen (% or mg/l).

Monitoring of Practices (BMPs) for management activities on the Shelter Cove Timber Sale will be part of the overall monitoring program being developed for the Ketchikan Area. The Monitoring Plan in Table 2-36 of the SCEIS indicates which practices will most likely be applied and then monitored for effectiveness; including how, units of measure, and responsible official.

To have valid monitoring results requires establishing standard procedures. The determination of the effects of roading and accompanying ditches, and cutting units, on stream

channels and sedimentation can be best monitored by the following methods:

1. One percent of the stream crossings and one percent of sale units will be monitored as part of the overall monitoring on the Ketchikan Area.
2. At least 50 feet above and below the road P line and drainage slope, or area of the sale unit, the stream will be cross sectioned, generally at 1 foot increments. The best approach for this is the use of the procedure called "sag tape." Two iron stakes are established on both sides of the channel, above the approximate 2 year flood level.
3. The measurements will be done yearly, pre-harvest, and after harvest begins.

   Note: The purpose of this type of data gathering is to ascertain whether or not there is channel translation equating to the loss of channel materials; i.e., bedload and suspended sediment.
4. At selected activity sites, dissolved oxygen (at low water period), temperature, and sediment will be monitored. Sediment will be monitored by the use of W-V boxes embedded in the channel, since we believe that this is representative of the embedding effects of sediment on spawning gravels in streams. There will be periodic measurement of temperature and dissolved oxygen and six month interval measurements of the W-V boxes. There should be at least a minimum of 2 years of monitoring before roading and harvesting, and a minimum of 3 years after a monitored activity is completed. Monitoring may need to be extended beyond the 3 years, especially where monitoring data indicates a continued increasing trend in water quality criterion.

Table 2-28
Soil and Watershed Mitigation Measures

Objective		Actions	Applications
1. Minimize or eliminate the potential adverse effects of road and stream crossing construction and maintenance to maintain water quality for the propagation of fish shellfish, and other aquatic life as defined by State of Alaska Water Quality Standards. Feb. 1979, amended. (Practices, proposed BMPs, are given in parentheses.)	A.	Bed culverts to prevent undermining and seepage. Use energy pools or other dissipating techniques at the outfall. (Practice 14.17)	Applies to all culvert installations.
	B.	Culvert gradient will follow natural gradient for non-fish streams where practical. Where natural gradient is not followed energy dissipators will be used. (P 14.17)	Applies to all water quality (class 111) streams.
	C.	Locate roads outside the designated riparian boundary wherever there is a practicable alternative. Where no practicable alternative exists location and construction will be in accordance with Process Best Management Practices (i.e., Interdisciplinary team involvement). (P 12.6, 14.13)	Applies to all AHMU areas.
	D.	Locate and construct roads paralleling streams or lakes to prevent introduction of sediment into surface waters during clearing. construction, and operating activities. When no practicable alternative exists, location and construction will be in accordance with process Best Management Practices (i.e., Interdisciplinary team process). (P 12.6)	Applies to all roads adjacent to lakes or streams.
	E.	Locate stream crossings where switchbacks and bridge approaches would not create drainage problems at the outfall. (P 12.7)	Applies to all stream crossings.
	F.	Design and construct bridge abutments to minimize disturbance to streambanks. (P 18.3)	Applies to all bridge abutments.
	G.	Road material used for stream crossing approaches should be substantially free of fine easily erodible sediments. Excess road materials should be kept out of the stream channel and streambank areas (i.e., above the 25 year flood level). (P14.14)	Applies to all stream crossings.
	H.	Wherever practicable road drainage structures and ditches will be designed and constructed to divert run-off from entering streams. (P 14.3)	Applies to all stream approaches.

Table 2-28 (Continued)
Soil and Watershed Mitigation Measures

Objective		Actions		Applications
1.	(continued)	I.	Stream courses may not be changed or diverted without written approval of the Forest Supervisor who shall issue approval after consultation with the Alaska Department of Fish and Game. (P 12.7)	Applies to all perennial streams.
		J.	Drainage structures on perennial streams will be installed concurrent with rock overlay operations. (P 14.3)	Applies to all perennial streams.
		K.	Brow logs will be provided on temporary bridges, i.e., log stringer bridges to contain surfacing materials and prevent introduction of sediment into the stream channel. (P 14.7)	Applies to all temporary
2.	Maintain stream crossings and road surfaces to minimize potential adverse impacts to water quality.	A.	Road running surfaces will be maintained to reduce the amount of surface sediment (runoff) entering adjacent streams. (P 14.20, 14.21)	Applies to all active roads.
		B.	Snow and accompanying road surface sediment will not be plowed into a body of fresh water. (P 14.23)	Applies to all stream crossings that are snow plowed.
		C.	Ditches and culverts will be kept clear of debris and other obstructions. They will be inspected/maintained as needed, but at least once a year. (P 14.20)	Applies to all culverts.
3.	Prevent man induced soil mass movement and minimize soil erosion related to road construction.	A.	On high and very high mass movement index soils rock quarry, borrow pit and full bench road construction blasting will be avoided during or within 72 hours following heavy rainstorms, unless a hydrologist or soil scientist determines that the soil ground water level will not cause a high risk situation. (P 14.7, 14.8)	Applies to all rock pits when the soil above the pit is saturated.
		B.	Use full bench road construction on slopes over 35 percent. (P 14.7)	Applies to all road construction on slopes over 35 percent.
		C.	On very high MMI soils full bench cut the slope and end-haul excavated materials. (P 14.7)	Applies to all road construction on very high mass movement index soils.
		D.	All proposed road construction on very high MMI soils will be reviewed by a soil scientist prior to construction. (P 14.7)	Applies to all proposed road construction on very high MMI soils.

Table 2-28 (Continued)

Soil and Watershed Mitigation Measures

Objective	Actions	Applications
3. (continued)	E. Rock quarries and borrow pits will not be located on very high mass movement index soils. (P 14.18)	Applies to all rock pits. Generally very high mass movement index soils are on slopes over 75 percent.
	F. End-hauled waste materials and overburden stripped from rock pits will not be deposited at locations that are susceptible to slumping and are outside the 25 year floodplain. (P 14.7)	Applies to all materials that are deposited outside the road corridor.
	G. Avoid construction on wetlands wherever there is a practicable alternative. Conduct all activities on wetlands, floodplains, and riparian areas in accordance with Best Management Practices (BMPs). BMPs included in the State's approved program baseline provisions are described in Federal Regulations 33 CFR 323.4 (a) (6) and are listed in the discussion section. (P 13.15, 14.2)	Applies to all wetlands, floodplains, and riparian areas.
4. Prevent human-induced soil mass movement and minimize soil erosion related to timber harvest.	A. The amount of disturbed soil (bared to mineral soil) should not exceed 25 percent of the project activity area. For timber harvest a project area is defined as harvest unit, roads and landings. Disturbance in the harvest unit will not exceed 15 percent. On high mass movement index (MMI) soils partial suspension is required. Disturbance should not exceed 10 percent. On very high MMI soils full suspension is required and disturbance should not exceed 5 percent of the harvest unit. (P 13.2, 13.5, 13.9)	Applies to all harvest units. Extended measures apply to units listed in Appendix B.
	B. Design units to allow split yarding on stream channels or provide log suspension over the streambed banks and inner gorge soils. Full log suspension is required on high or very high MMI soils in these areas. Trees shall be wedged, jacked, lined or pulled where necessary. (P 13.16)	Applies to all units containing water quality streams.

Table 2-28 (Continued)

Soil and Watershed Mitigation Measures

Objective	Actions		Applications
4. (continued)	C.	Maintain windfirm vegetation on inner gorge soils to provide a root network to maintain long-term slope stability on high or very high MMI soils. Selectively leave windfirm timber in inner gorges (V-notches). Select trees that do not significantly extend above the break in slope at the top of the inner gorge. The objective is to retain a portion of the root network for slope stability, but remove windthrow prone trees and trees that will create operational problems. (P 13.16, 13.17)	Applies to all V-notch areas adjacent to water quality streams.
	D.	Stabilize areas of exposed mineral soil. The objective, at the end of the first year, is 50 percent vegetative ground cover (living and/or inert) and 75 percent ground cover at the end of the second year. Erosion control matting, berms, and/or diversions may be necessary in some cases. Areas of exposed mineral soil include road cuts and fills, areas disturbed by logging activities and windthrow, slide deposit areas, end-haul deposit areas, and overburden deposit areas from rock pits. (P 13.12)	Applies to all areas of exposed mineral soil.
	E.	All proposed harvest on very high MMI soils will be reviewed by a soil scientist prior to harvest. (P 13.5)	Applies to all proposed harvest on very high MMI soils.

Table 2-29

Wildlife Mitigation Measures

Objective	Actions		Applications
1. Improve second-growth habitat by: (a) increasing forage production levels associated with early stages of succession; and (b) providing for habitat diversity.	A.	Precommercially thin in high quality deer and bear habitat stands in the 10-18 year age class to a variable spacing of 16x16 feet	Applies to high quality deer and bear habitat (see Appendix B, for Wildlife Specific Mitigation Measures)
	B.	Create canopy gaps of approximately one tenth to one twenty-fifth acre in size, for 5 percent of stands in the 15-36 age class. Selected gaps will be maintained on a 10 year schedule.	Applies to specific units (see Appendix B, Wildlife Unit Specific Mitigation Measures)

Table 2-29 (Continued)
Wildlife Mitigation Measures

Objective		Actions	Applications
2. Maintain nesting, denning, perching, and hiding cover for riparian wildlife; provide areas of existing forage throughout rotation.	A.	Leave smaller (<12 inch DBH) windfirm timber within 150 feet of open muskegs >25 acres/and containing a mixed conifer plant plant association.	Applies to all harvest units containing or adjacent to open muskegs >25 acres with a mixed conifer plant association.
	B.	Implement selected option of Aquatic Habitat Management Units Standards and Guidelines to meet the habitat requirements of: Vancouver Canada goose, black bear, and river otter.	Applies to all Class I and II Aquatic Habitat Management Units.
3. Increase forage production.	A.	Use a native seeding mixture in conjunction with erosion control species.	Applies to all temporary roads and log landings.
4. Provide and/or maintain protection of existing nesting trees in known eagle habitat where timber harvest is occurring.	A.	Leave and maintain windfirm nesting buffers 330 feet of more in diameter.	Applies to all Bald Eagle nests (see memorandum of Understanding listed in the Wildlife Appendix D).
5. Provide for ecological requirements of cavity and snag dependent MIS species.	A.	Leave an average of 2.75 snags or dominant green trees per acre within each logical setting which would be consistent with OSHA safety standards. These snags and green trees may be concentrated near the edge of, or between, logical settings.	Applies to all harvest units.
6. Design an access management plan if the Shelter Cove roads are ever connected to the greater Ketchikan system.	A.	Implement the Access Management Plan (see Access Plan and maps).	Applies to specific units identified upon implementation of Access Management Plan.
7. Provide microdiversity within harvested areas.	A.	Leave 3 to 5 acres windfirm islands within selected units. There should be at least one island for every 20 acres harvested. Priority should be given to: 1) healthy timber stands, 2) stable soils, 3) slopes less than 70 percent, 4) areas of extensive harvest consisting of >60 percent of the VCU, 5) areas near important eagle habitats, and 6) areas near wildlife corridors.	Applies to specific units (see Appendix B, Wildlife Unit Specific Mitigation Measures).
8. Reduce windthrow potential in association with identified old growth (increasing diversity by increasing the edge).	A.	Feathering of harvest unit boundaries in a sawtooth configuration will occur in selected units throughout the planning area. Priority will be given to: a) units adjacent to old-growth retention that are undergoing harvest, and, b) extended rotation units.	Applies to specific units (see Appendix B, Wildlife Unit Specific Mitigation Measures).

Table 2-30
Aquatic Habitat Management Unit Timber Harvest Mitigation Measures

Objective		Actions	Applications
1. Maintain streambank stability and prevent lateral scouring.	A.	Leave vegetation necessary to maintain streambank stability, generally 25 feet on either side of stream.	Applies to all streams where streambank stability is controlled by vegetation and not by bedrock.
	B.	Design timber sale units to yard away from streams (split yarding). Fell timber away from stream.	Split yarding to be emphasized on all class I, II, and III streams. However, there may be cases where full suspension over stream would be preferred to reduce impact of additional road and landing construction.
	C.	Fully suspend logs if necessary to yard over streams.	Applies to all class I and II streams. Class III streams addressed in soils and watershed mitigation measures.
	D.	Defer harvest units to avoid impacts on braided stream channels and dense networks of small rearing tributaries.	These areas were avoided during IDT development of alternatives. If these areas are encountered during layout, an IDT will complete the design to assure streambank stability is maintained.
	E.	Trees felled into or across streams shall be left in the stream. However, unattached debris less than 4 inches diameter shall be removed by hand within 48 hours.	Applies to all class I and II streams.
2. Prevent stream sedimentation.	A.	Sedimentation primarily addressed in water quality section.	Applies to all class I, II, and III streams.
3. Maintain sufficient riparian vegetation for long-term large organic debris (LOD) input.	A.	Leave windfirm no-cut zone of 200 feet from streambank.	Applies to all floodplain channels (C1, C3) except small floodplains (B1).
	B.	Leave windfirm no-cut zone of 100 feet from streambank.	Applies to all class I Lakesides (LS), and class I low gradient contained (C2, C5).
	C.	Leave a windfirm no-cut zone of 100 feet from streambank.	Applies to small floodplain channels (B1).
	D.	Leave a windfirm no-cut zone of 100 feet from streambank.	Applies to all remaining class I and II streams which are direct tributaries to class I streams.
	E.	If fully suspending logs across streams (when cross-stream yarding is necessary) leave at least 75 percent of standing vegetation within 25 feet of stream and protect from felling and yarding damage.	Applies to all class I and II streams. Class III addressed in soils and watershed mitigation measures.

Table 2-30 (Continued)

Aquatic Habitat Management Unit Timber Harvest Mitigation Measures

Objective	Actions	Applications
3. (continued)	F. During commercial harvest operations, trees to be left within 100 feet of stream when it does not conflict with safe harvest operations, include: 1. All deciduous trees. 2. All coniferous trees less than 12 inches DBH. 3. All snags. 4. Leaning coniferous trees of all sizes that cannot be safely and effectively fallen away from the stream (usually trees with less than 10 percent lean).	Applies to all class III streams not draining into class I streams, and class III streams.
	G. Leave all large organic debris (LOD) over the stream.	Applies to all streams.
4. Maintain sufficient vegetation to insure wind firmness to no-cut zones along streams.	A. Where selective harvest methods cannot be applied, develop a precription ot maintain windfirm zone considering factors such as topography, wind patterns, and forest cover.	Applies to all class I streams.
	B. If necessary selectively harvest windfall prone trees (1/2 canopy above slope break).	Applies to all class II and III streams.
5. Maintain stream adjacent sideslope to prevent landslide or sediment.	A. Locate units at or above the break in slope on steep stream sides. If necessary to provide windfirmness for trees remaining on sideslopes, use selective harvest techniques above break in slope.	Applies to all AHMU class I streams.
	B. Locate units at/or above the break in slope above steep stream sides. If necessary to provide windfirmness selectively harvest windfall prone trees (1/2 canopy above slope break).	Applies to all class II and III streams.
6. Maintain habitat conditions in off channels, unmappable low-gradient spawning and rearing tributaries.	A. Maintain streamside vegetation to protect existing habitat conditions. When applicable, a prescription will be developed and incorporated into the unit design and layout process.	Applies to all class I streams
7. Maintain streamside vegetation to maintain or improve summer water temperature regimes.	A. Retain 75 percent of shade producing vegetation on SE, S, SW, and W banks of all streams.	Applies to all class I and II streams in temperature sensitive VCUs.
8. Maintain streamside vegetation to prevent increase of anchor ice and freezing winter rearing habitat.	A. Maintain no-cut zones as prescribed for LOD recruitment (3a-g).	Applies to all class I streams.

Table 2-30 (Continued)

Aquatic Habitat Management Unit Timber Harvest Mitigation Measures

Objective		Actions	Applications
9. Maintain standing vegetation on alluvial fans to provide channel stability and LOD inputs.	A.	No harvest activities on active portion of alluvial fans.	Applies to all alluvial fans.
	B.	Locate units a minimum of 100 windfirm feet from outer historic channels. Leave all interior vegetation.	Applies to all class I and II alluvial fan channels (B5, A3).
	C.	Locate units a minimum of 25 windfirm feet from outer historical channels. Leave all interior vegetation.	Applies to all class III alluvial fan channels (B5, A3).
10. Maintain recreational fishing opportunities, access and aesthetic values.	A.	Design harvest within AHMU to provide for windfirmness of no-cut zones and maintain access and aesthetic values of the site.	Where identified in Appendix Potentially large floodplains (C3), large glides (L2), estuaries (E), and lakes with fish (class I and II L).
11. Maintain sufficient riparian vegetation for habitat needs of riparian dependent wildlife species.	A.	Leave windfirm no-cut zone of 500 feet from high tideline.	Applies to large estuaries (E1).
	B.	Leave windfirm no-cut zone of 300 feet from streambank.	Applies to large glides or lake outlets (L2).
	C.	Leave windfirm no-cut zone of 200 feet from streambank, high tideline, or lake.	Applies to class I lakesides (LS), all floodplain channels except B1 (C1,C3), and small estuaries (E2, E3).
	D.	Leave windfirm no-cut zone of 100 feet from streambank.	Applies to small class 1 glides (L1).
	E.	Leave windfirm 100 foot no-cut zone from lakesides and streambanks.	Applies to all class II lakesides.
12. Maintain fish passage for anadromous and resident fish.	A.	Design stream crossings to provide fish passage.	Applies to class I and II stream crossings.
	B.	Maintain stream crossing to provide fish passage through the road maintenance program.	Applies to all stream crossings with fish passage needed generally class I and II streams
	C.	Notify and consult with the Alaska Department of Fish and Game on any plans not to provide fish passage.	Applies to all class I and II stream crossings.
13. Protect spawning adults, including eggs and fry from disturbance.	A.	In-stream crossing construction activities will generally be limited to time period that will not cause a reduction in egg or fry survival, or disturb spawning adults (generally May 15 to August 15). During the	Applies to most class I stream crossings, and some class II and III crossings. (See Appendix B.)

Table 2-30 (Continued)

Aquatic Habitat Management Unit Timber Harvest Mitigation Measures

Objective		Actions	Applications
13. (continued)	A.	remainder of the year, only construction activities designed to prevent impacts to eggs, fry, or spawning adults will be approved.	
	B.	In-stream blasting activities will be limited to 2 psi during the restrictive time period (generally August 15 to May 15) to prevent a reduction in egg or fry survival, or disturbance of spawning adults.	Applies to all class I streams Final report on 2 psi Blast Monitoring Program for U.S. Borax Quartz Hill Molybdenum Mine Road Project, dated December 1982.
	C.	Notify and consult with the Alaska Department of Fish and Game on all in-stream construction and crossings outside the above time.	Applies to all class I stream crossings.
14. Maintain streambank stability, prevent sedimentation from stream crossing construction.	A.	Equipment use within a stream channel for structural placement will be limited to absolute minimum necessary to establish the structure in place.	Applies to all class I and II streams.
	B.	Allow equipment in streams only when necessary and under direct Forest Service supervision.	Applies to all class I and II streams.
	C.	Culverts will be installed concurrent with rocking operations.	Applies to all perennial stream crossings.
15. Maintain channel and bank stability.	A.	Limit flow constrictions or diversions of stream at crossings.	Applies to all stream crossings.
	B.	Stream courses may not be changed or diverted without written approval of the Forest Supervisor after consultation with ADF&G.	Applies to all stream crossings.

Table 2-31

Aquatic Habitat Management Unit Harvest Standards and Guidelines

Process[1] Group	Channel[1] Type	AHMU Class	AHMU Distance[2]	Rx[3]	Objectives[4]
FLOODPLAIN	B1	I,II	100	100	LOD, OFF
	C1	I	300	200	LOD, OFF, WLF, REC
	C3	I	500	200	LOD, OFF, WLF, REC
ALLUVIAL FAN	B5	I	200	100' BOHC[5]	LOD, OFF, BS
		II	200	100' BOHC	LOD, OFF, BS
	A3	I	100	100' BOHC	LOD, OFF, BS
		II, III	100	100' BOHC	LOD, OFF, BS

Table 2-31 (Continued)

Aquatic Habitat Management Unit Harvest Standards and Guidelines

Process[1] Group	Channel[1] Type	AHMU Class	AHMU Distance[2]	Rx[3]	Objectives[4]
GLIDE	L1	I	100	100	BS, OFF, WLF
		II	100	100	BS, OFF
	L2	I	300	300	BS, WLF, REC
LAKESIDE	LS	I	200	200	OFF, LOD, REC, WLF
		II, III	200	200	BS, LOD, WLF
		III		200	BS, LOD, WLF
ESTUARY	E1	I	500	500	REC, OFF, WLF
	E2	I	200	200	REC, OFF, WLF
	E3	I	300	300	REC, OFF, WLF
MIXED CONTROL	B2	I, II	100	100	LOD, BS, SDSL
	B3	I, II	100	100	LOD, BS, SDSL
LOW GRADIENT CONTAINED	C2	I	100	100	LOD, SDSL, WLF
		II	100	100	LOD, SDSL
	C5	I	100	100	WQI, SDSL
MOD GRADIENT CONTAINED	B4	I, II	100	100[6]	SDSL
	B4	III	100	SLOPE BREAK[7]	WQI, SDL
	B6	I, II	100	100[6]	SDSL
	B7	I, II	100	100[6]	WQI
HIGH GRADIENT CONTAINED	A1	III	200	SLOPE BREAK	WQI, SDSL
	A2	I, II	100	100[6]	WQI, SDSL, LOD
	A2	III	100	SLOPE BREAK	WQI, SDSL
	A4	III	100	SLOPE BREAK	WQI, SDSL
	A5	II	100	100[6]	WQI, SDSL, LOD
	A5	III	100	SLOPE BREAK	WQI, SDSL
	A6	II	100	100[6]	WQI, SDSL, LOD
	A6	III	100	SLOPE BREAK	WQI, SDSL
	A7	II	100	100[6]	WQI, SDSL, LOD
	A7	III	100	SLOPE BREAK	WQI, SDSL

[1]See Chapter 3 for definitions of Process Groups and Channel Type Classification.

[2]AHMU Distance = The AHMU delineation distance in feet for this channel type from each side of the stream (see Chapter 3).

[3]Rx = Generalized streamside prescription in feet estimated for each channel type to meet appropriate S&G for this stream type. The prescription is a no-cut distance.

[4]Objectives = The management objective that would be achieved through the applied prescription. Management objectives listed as follows:

- LOD Large organic debris recruitment for channel maintained.
- OFF Off channel and unmappable low gradient tributary habitat maintained as part of the no cut zone.
- BS Bank stability of channel maintained.
- SDSL Stream sideslopes maintained.
- WQI Water quality criteria maintained.
- REC Potential sport fish recreational sites maintained.
- WLF Riparian dependent wildlife species habitat requirements met.

[5]BOHC = Beyond outer historic channels; the outer channel of the alluvial fans used to define the active portion of fan.

[6]100 feet only if a direct tributary to a class I stream.

[7]SLOPE BREAK = Slope break of stream sideslope. Management objective is tied to unit layout at or above this slope break, not a standard distance.

Table 2-32
Visual/Recreation Mitigation Measures

Objective	Actions	Applications
1. Design timber harvest with landscaspe architect to meet the visual quality objectives set.	A. Adjust unit boundaries where possible to reduce apparent size and screen bare harvested ground to minimize impact of harvest clearings.	Applied primarily on land-scapes & with uniform slopes and
	B. Adjust dispersal of harvest unit settings where possible to minimize impact of harvest clearings.	Homogenous forested cover where no natural features exists with which to blend harvest units. To reduce apparent scale of cleared areas relative to remaining more mature or old-growth stands.
	C. Shape unit boundaries to replicate nearby natural openings and land-form shapes.	Applied primarily on landscapes with some vegetation and/or terrain
	D. Locate unit boundaries so unit blends with topographic features such as ridges, knobs, benches, and swales.	Diversity to which harvest units can be related
	E. Adjust unit boundaries to hide unit backlines and other edges.	Applied primarily to units near tops of ridges, knobs, or near benches.
2. Provide scenic vistas in locations selected during unit and road design.	A. Design units and roads in specified areas to open views. Remove slash from area adjacent to planned vistas.	Applied to arterials & some collectors at offer scenic driving opportunities and other roads that provide hiking opportunities to recreation and/or scenic attractions.
3. Design roads and rockpits with landscape architect to mitigate Visual and Recreation impacts.	A. Locate road to minimize visual impact from key view points.	Applied to logging road corridors near steep slopes where cut and fill slopes and ROW clearing may create visual impacts.
	B. Use full bench cut and endhaul material where slopes are too steep to hold material and/or where residual trees do not provide enough screen to permit road to meet intended visual quality object.	Applied on roads across steep slopes of sensitive viewsheds.
	C. Locate and design rockpits to minimize visual impacts. Retain screen trees where necessary to meet this objective. Fully rehabilitate rockpit area. This includes grading floor to drain, cleanup and finished grading of overburden and waste rock, and seeding.	Applied to rockpits near or along arterial roads or potentially visible from lakes, streams, saltwater, or other sensitive viewing positions.

Table 2-32 (Continued)
Visual/Recreation Mitigation Measures

Objective		Actions	Applications
3. (continued)	D.	Landscape architect and project engineer will work on a case by case basis to limit ROW clearing to a minimum as cut and fill slopes permit.	Applied to roads having potential visual impacts or other roads that would serve as hiking trails to recreation attractions after logging is complete.
	E.	Mitigate the effects of sidecast slash within 30' of the road shoulders by the most appropriate of the following methods: (1) bury slash in roadbed, (2) endhaul slash to a central, approved area, and (3) pile slash in non-impacting areas. Consolidate slash as much as practicable, cover with soil and shape to natural contours. Leave clear access corridors from the road at regular intervals of 100 to 200 feet.	Applied to arterial roads or roads serving as trails to recreation attractions
	F.	Apply grass seed and fertilizer to all cut and fill banks.	Applied to arterials, roads serving as future recreation trails, and roads creating visual impacts from cut and full slopes.
4. Design timber harvest units, roads, and associated developments to protect and enhance recreation opportunities.	A.	Schedule harvest and roadbuilding activities to minimize years during which activities will occur to reduce impacts from noise.	Applied to areas where the intent is to preserve a primitive to semi-primitive recreation experience South Saddle Lake, Buckhorn Lake.
	B.	Areas with potential recreation values and sites will be analyzed on the ground in advance of unit & road location. Roads, turnouts, rockpits, & unit boundaries will be designed to protect scenic values of identified recreation sites and to provide where appropriate well designed access to recreation features.	Applied to roads and units near inventoried recreation sites, sites identified in alternatives for development and areas such as lakes, streams saltwater shores and alpine areas where other potential rec. attractions may exist.
	C.	Adjust unit boundaries near identified sportfishing areas on stream and lakes to retain approximately 300 feet of windfirm timber on each side of the waterbody.	Applied to units near sportfishing areas on lakes and streams identical in alternatives for development or where other potential recreation attraction may exist.
	D.	Identify and adjust unit boundaries to retain old-growth recreation/subsistence access corridors to alpine, etc.	Applied primarily to areas where past harvest has resulted in limited remaining old growth connecting alpine areas with identified recreation and/or subsistence use.

Table 2–33
Cultural Resources Mitigation Measures

Objective	Actions	Applications
1. Minimize or eliminate the potential adverse effects of all ground disturbing activities upon cultural resources as defined by the National Historic Preservation Act of 1966 as amended, the Archaeological Resources Protection Act, the Antiquities Act of 1906, the American Indian Religious Freedom Act, and 36 CFR 60, 63 and 800.	A. Evaluate all project activities prior to implementation.	Applies to all project activities.
	B. Perform a determination of effect of all project activities.	Applies to all project activities.
	C. Perform a determination of eligibility for all cultural resources that may be affected by project activities.	Applies to all project activities.
	D. Develop additional measures which may include data recovery through excavation, archival research and/or architectural studies for all properties which are determined eligible for the National Register of Historic Places and may be affected by project activities.	Applies to all project activities.

Log Transfer Facilities

The project area contains three existing log transfer facilities owned by the Cape Fox Corporation. A new log transfer facility is needed for all alternatives which would be located at Shelter Cove.

The new facility at Shelter Cove was selected per the interagency guidelines (Log Transfer Facility Siting, Construction, Operation, and Monitoring/Reporting Guidelines). For details please refer to this document which is on file at the Ketchikan Ranger District. Table 2–34 summarizes the LTFs involved in the various alternatives. See Figures 2–6 to 2–8 of the Maps document for detailed information.

Table 2–34
Summary of LTFs Involved in Each Alternative

LTF	Alternatives[3] 1	2	3	4	5	6	Land Ownership	System Type	Existing
Coon Cove East[1]		N	N	N	N	N	Cape Fox	A-Frame	Yes
Coon Cove West[2]		N	N	N	N	N	USFS/Cape Fox	A-Frame	No
Hume Island[2]		N	N	N	I	I	Cape Fox	A-Frame	Yes
White River[1]		N	N	N	N	N	Cape Fox	Push-In Ramp	Yes
Shelter Cove		C	C	C	C	I	USFS	A-Frame	No

[1]The location of this LTF makes it unsuitable for the proposed use.
[2]The use of these facilities would depend on an arrangement between the USFS and Cape Fox, since the LTFs are on private land.
[3]C = Planned for Continuous Use; I = Planned for Intermittent Use; N = Not Planned for Use.

2 Alternatives

Sites

The following section displays the sites considered, but eliminated from detailed study, sites considered in detail and transfer methods examined. See the Maps document (Figures 2-9 to 2-12) for further details.

Sites Considered, but Eliminated From Detailed Study

Carroll Inlet—Sites 2 and 4—North Island Point (Site 2) and Osten Island (Site 4) are located on the west side of Carroll Inlet near Osten Island, and 1.5 miles north of Island Point. Both sites contain rough terrain on the uplands.

The bark dispersal characteristics of the Osten Island site are inadequate due to a deep underwater pocket between Revillagigedo and Osten Islands. Because of high development costs and disturbance, these sites were eliminated from further consideration.

George Inlet—Sites 6 and 8— The existing Coon Cove site (Site 6) has had past use for short-term sales, and later for harvest on private land selections. This site was dropped from further consideration because of shallow waters and proximity of the tide flats. This site would need to be relocated to a site 0.5 miles west, at the mouth of Coon Cove (see Coon Cove West—Site 7). White River (Site 8) is an existing LTF on the west side of George Inlet that is under private ownership. Since this LTF is not involved in any of the proposed alternatives, due to location, it does not merit further study.

Sites Considered in Detail

Carroll Inlet—Sites 1, 3 and 5—The Shelter Cove (Site 1) and South Island Point (Site 3) sites are located on the west side of Carroll Inlet. Site 1 is near Shelter Cove, and Site 3 is about 0.5 miles south of Island Point. Both sites are suitable for development. The Shelter Cove Site, centrally located, was found biologically acceptable by the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, and the National Marine Fisheries. The South Island Point Site, located less centrally, would require about a mile of additional access road and a significant amount of additional haul. Site 5, the existing Hume Island LTF, is also on the east side of the inlet near Hume Island. This site is currently in use, and is owned by Cape Fox Corp. on their private landholdings. Although this site would be acceptable for the plan's proposed use, an agreement for its use would have to be reached between the Forest Service and Cape Fox before log transfer operations could begin at this site.

George Inlet—Site 7—The proposed Coon Cove West (Site 7) LTF would be located immediately south of the mouth of Coon Cove on the east side of George Inlet (about 0.5 miles west of the existing private LTF). This site has not been evaluated for marine impacts. The proposed relocation, however, would place the site away from the known high value estuarine areas. Evaluation of this site for marine impacts would be accomplished prior to development.

Log Transfer Methods Studied in Detail

The log transfer methods considered in detail are low gradient slide with rafting facilities, float off-push in ramp with rafting, an A-frame lift-off with rafting facilities, and a dry land transfer facility. There are other types of log transfer methods; however, most would be a variation of those studied in detail and biological and economic variations are similar.

Low-Gradient Slide With Rafting

This design would include a steel or wood slide with a 22 percent or less gradient that would, under typical conditions, allow the log bundles to slide unassisted into the water while keeping the speed of entry into the water at a minimum. During dry conditions log bundles would have to be pushed down the slide. The slide would be designed to remove the bark debris that accumulates at the upper end of the slide.

Typically, 20,000 cubic yards of rock would be needed to construct a log transfer facility of this type. About 0.7 acres of intertidal marine habitat would be covered with rock. A 20–30 acre sort yard would be needed. To construct log rafts, a 2–3 acre booming area in the water would be required near the site. A typical facility of this design would cost $200,000 to $300,000 to construct. Gently sloping beaches are required to accommodate a low gradient slide system.

Float Off-Push In Ramp With Rafting

Typically, this system consists of a shot rock ramp with steel rails built at a 10 percent grade or less to allow operation of a rubber-tired log loader on the ramp. This type of system does not accommodate use of off highway log trucks as large log unloaders needed for off-highway loads cannot negotiate the 10 percent grade of the ramp. The float off–push in ramp is suited for small operations using small on-highway truck loads. If off-highway loads are unloaded and broken into smaller bundles, then the facility could accommodate large loads. Off-highway haul would require a 10–20 acre sort and breakdown yard.

A float off-push in ramp requires 2000–3000 cubic yards of rock embankment for the ramp. About 0.25 acres of intertidal marine habitat would be covered by the ramp. A 2–3 acre raft booming area and 15–20 acres of raft storage area would be needed. These facilities generally cost between $70,00 and $200,000 to construct depending upon the site and equipment used.

A-Frame Transfer With Rafting

Typically, the A-frame transfer method consists of a shot rock pad, two-drum yarder or crane hoist engine with a fixed mast and falling boom arrangement to lift log bundles from truck to water. A-frame systems are most often used for handling timber volumes to 10 MMBF and up.

The pad is generally 120 to 150 feet wide and 120 to 150 feet long on the bulkhead side. The bulkhead is 60–80 feet long and 15–20 feet high. The shot rock pad requires about 5,000–9,000 cubic yards of rock fill. These facilities generally cost $17,000-$300,000 to construct and equip, depending upon site conditions, construction materials, and equipment used.

The A-frame sites generally take advantage of steeper sloped beaches and moderately sloped uplands to balance the excavation and embankment materials. Approximately 0.3 acres of intertidal and subtidal marine habitat would be covered with rock.

Rafting areas required for large volume operation tend to be 20–30 acres for raft building and storage. Operations handling 50–60 MMBF per year require much larger rafting areas.

Dry Land Transfer to Barge

The face of a barge facility needs to be constructed at the minus 25-foot tide level to accommodate a loaded barge with at least 5 feet of water under the barge at low tide. The face of the facility has to be at least 60 feet wide to allow for operating room and barge stability during the loading operation. The height of the facility is normally 5 feet above high tide.

About 70,000 cubic yards of rock would be needed to construct a barge facility at any of the sites considered in this DEIS. About 1.8 acres of interitidal and subtidal marine habitat would be covered with rock. About 10,000 cubic yards of dredge material would be removed in preparing for the foundation of the structure. A 5–6 acre sort yard would be needed within 500 feet of the face of the log transfer facility to minimize loading time. With this type of facility, logs are transferred from land to a barge without entering the water. A typical facility of this design would cost about $1.6-$2.9 million to construct.

Access Management

The area of the Tongass National Forest considered in this FEIS is approximately 15 miles northeast of Ketchikan, Alaska. There are known to be at least 36 miles of existing road within the project area, with many unmapped miles located on private lands. None of the existing roads considered for use in some of the alternatives are connected to any other area of Revilla Island. This existing road system is accessible by float airplane, boat and foot. There has been very little use of this existing road system after completion of logging.

The alternatives considered in this FEIS would all allow public use of the proposed road system during logging. Public use would be very limited, however, since none of the proposed alternatives would be connected to the existing road systems or other sections of Revilla Island. None of the alternatives connect with the greater Ketchikan road system.

After logging, all alternatives would allow public access to all areas within the project area. The existence of more road in the area would not significantly increase the numbers of visitors to the Shelter Cove area, because the area would still only be accessible by float airplane, boat and foot.

Other Requirements or Considerations

Maximum Size of Created Openings

The NFMA regulations provide that 100 acres is the maximum size of created openings to be allowed for the hemlock–Sitka spruce forest type of coastal Alaska, except under specific conditions. The Alaska Regional Guide (p. 3–20) contains provisions if the 100-acre size limit is exceeded. Harvest units which exceed the 100-acre size will follow the provisions outlined in the Alaska Regional Guide. Table 2–35 summarizes the harvest unit size by alternative.

A listing of units exceeding 100 acres in size can be found in Appendix A. The primary factors contributing to the interdisciplinary decision to exceed the 100-acre size guideline are also listed by unit and alternative.

Table 2-35
Unit Size by Class and Alternative

Alternative	No. of Units	Acres of Harvest	Average Unit Size	No. of Units Over 100 Acres and Less than 150 Acres	No. of Units Over 150 Acres and Less than 300 Acres	Largest Unit Size
1	0	0				
2	44	2191	49.8	1	0	110
3	51	2231	43.8	1	0	106
4	51	3603	70.7	4	2	169
5	48	2581	53.7	2	0	135
6	59	3060	51.9	2	0	135

Monitoring

All action alternatives are subject to monitoring and reporting requirements contained in Forest Service manuals and handbooks. The monitoring requirements will be part of the implementation for all of the alternatives.

Table 2-36 displays the items to be monitored as part of implementing any of the actions proposed in this FEIS. For each resource being monitored, it lists what is to be measured, how it is to be measured, the unit of measure, and frequency of measurement.

Table 2-36
Monitoring Plan

Resource	Items to be Measured	How Measured	Unit of Measure	When Measured	Responsible Official
Timber	Restocking ensured within 5 years.	Stocking surveys scheduled for each project.	Acres—meeting standards.	After harvest: natural regeneration: stocking surveys third or fourth year. Plantations: survival surveys first and third party.	District Ranger.
	Conformance of final unit layout to EIS.	Check final EIS maps, unit layout and road location cards incorporating prescriptive input for each resource.	Acres.	Ongoing: prior to sale and end of sale operating period.	District Ranger.
Wildlife	150 foot buffers surrounding 25 acre or larger muskegs containing a shore pine-mixed conifer/blueberry/skunk cabbage plant association.	Distance between muskeg and harvest unit boundary.	Feet.	Within 12 months after unit harvest.	District Ranger.
	Adherence to bald eagle nesting buffer areas.	Distance from existing nest trees to clearcuts or roads.	Feet.	During presale unit layout prior to unitharvest and immediately after unit harvest on every unit containing bald eagle nests.	District Ranger in coordination with S.O. Wildlife Biologist.
	Eagle nesting tree buffer windfirmness.	Select buffers—visual inspection.	Percent buffer remaining.	One to five year intervals on 5 percent of buffers.	District Ranger in coordination with S.O. Wildlife Biologist.
	Snags or dominant green trees remaining within the harvest unit.	Visual count of number of snags remaining after harvest (through application of Wildlife Mitigation Measure 6).	Number of snags.	Within 12 months after unit harvest, then every 3 years thereafter until regeneration, on 5-10 percent of the units.	District Ranger.
	Effectiveness of road closures.	Traffic counters.	Number of vehicles on officially closed road.	When road is finally closed by management, then every year thereafter, on 5 percent of the closed roads.	District Ranger. in coordination with S.O. Engineering.

Table 2-36 (Continued)
Monitoring Plan

Resource	Items to be Measured	How Measured	Unit of Measure	When Measured	Responsible Official
	The effectiveness of feathering associated with old-growth boundaries in minimizing windthrow to adjacent timber.	Aerial survey and photograph of remaining wind boundaries incorporating unit mpas. Planameter areas and compare.	Percent remaining standing after adjacent to feathered vs. non-feathered areas.	Every 2 years until the harvested stand is regenerated, on seven units.	District Ranger in coordination with Forest Ecology Group.
	Implementation of project for compliance with decisions concerning wildlife mitigation, concerns, and opportunities.	By visual inspection.	Variable, dependent upon mitigation measure.	During project layout and after harvest.	District Ranger in coordination with S.O. Wildlife Biologist.
	Effectiveness of Old-growth Blocks.	Observing presence or absence of old-growth species, or indication of their abundance.	Number of old-growth species.	Annually for up to 3 years before project implementation and for 3 years following harvest.	District Ranger in coordination with S.O. Wildlife Biologist.
Soils and Water	Adherence to meeting approved yarding systems for high mass movement index sites.	100% unit card for sale units with high or very high MMI soils.	Percent actual versus designed. units after harvest.	All high and very high MMI units during and after harvest.	Soil Scientists.
	Ground protection requirement resulting from approved yarding system for the unit.	Measured transects on 10% of selected units having full or partial suspension.	Percent unit disturbed.	After harvest.	District Ranger.
	Adherence to water quality BMPs.	100% unit and road location cards before and after comparisons.	BMPs implemented or not.	All sale units and road segments annually.	District Ranger.
	Effectiveness of standards and guidelines in preventing management induced mass movement.	Visit to site.	Number and acreage logging system or road construction technique.	Within one year of occurrence.	Soil Scientists.

Table 2-36 (Continued)
Monitoring Plan

Resource	Items to be Measured	How Measured	Unit of Measure	When Measured	Responsible Official
		Physical measures: Transects of length, width, and release head wall information.	Acres.	Year slide occurs.	Soil Scientists.
	Site disturbance acres for rehabilitation.	Transects of length and width.	Acres.	Annual assessment of watershed needs.	Soil Scientists with District assistance.
	Stabilization of areas of exposed mineral soils.	Physical measurement transects.	Percent with vegetative cover.	Selected units annually for 3 years after disturbance.	Soil Scientists with District assistance.
	Effectiveness of Practices in road construction at stream crossings, and harvest units (mass movement) in meeting State Water Quality Standards. 1. Road crossings (P 12.7, 14.3, 14.7, 14.14, 14.7). 2. Sale units (P 13.2, 13.5, 13.9, 13.16, 13.17).	Physical measurements of sedimentation, water temperature, and dissolved oxygen. 1% of road crossings and harvest unit sites.	Sediment, ppm; temperature, °C; dissolved oxygen, % or mg/liter.	Before and during activity; 1 year after activity.	Hydrologist.
Cultural/ Archaeological	Vandalism: effectiveness of protective measures.	Incidence and degree of vandalism.	Number of sites affected, % of site areas affected.	Annual review of selected sites.	S.O. Archaeologists.
	Natural deterioration of cultural resource sites.	Incidence and degree of deterioration.	Number of sites affected, % of site areas affected.	Annual review of selected sites.	S.O. Archaeologists.
	Effect of project activities upon cultural resources.	Incidence and degree of adverse effects of project activities upon cultural resources.	Number of sites affected, % of site areas affected.	Annual review of project activities.	S.O. Archaeologists.
	Project cultural resource surveys.	Ratio of acres surveyed/ cleared to cultural resources affected.	Acres mapped and evaluated; sites recorded and evaluated.	Prior to project implementation.	S.O. Archaeologists.

Table 2-36 (Continued)
Monitoring Plan

Resource	Items to be Measured	How Measured	Unit of Measure	When Measured	Responsible Official
Fish Habitat	Effectiveness of standards and guide-lines in maintaining large organic debris.	Use Unit Monitoring Form to determine percent of implementation (Fig. 2-13).	Percent of units where implemented as prescribed.	Selected sale units and road segments after harvest.	S.O. Fish Biologist.
		Determine % of habitat that is affected or changes over time.	Change in number and area of stream micro-habitats over time.	Before harvest, 1 year after, and 5 years after.	District Ranger.
	Maintain streambank stability of class I and II streams.	Measure the amount of streambank disturbance before sale activities, then measure amount after. 5-15% of units.	Percent of streambank disturbance before and after sale, compare the two.	Six months or less before timber sale and less than 1 year after sale.	District Ranger.
	Buffer windfirmness.	Visually estimate if blow-down has occurred in all buffewrs within sale.	Percent in buffer remaining.	Years 1, 3, 5.	District Ranger.
	Maitain stream sideslope stability.	Occular measurement of % unit located below steep (70% +) stream sideslopes, 10% of units.	Determine % of steep sides included in unit, vs. outside unit.	Within 1 year after logging.	District Ranger.
	Maintain habitat conditions in off channels, unmappable low-gradient spawning-rearing areas.	AHMU prescription for class I streams implemented.	Visual observation of whether the prescribed Rx is followed. Yes or no.	Immediately after unit is harvested.	District Ranger.
	Maintain streamside vegetation to maintain or improve summer water temperature.	Solar densometer (or other method). Measurements within AHMU southern portions.	Percent retention of AHMU vegetation along SE to W banks.	Units in Nigelius Creek before and after.	District Ranger.
	Maintain streamside vegetation and LOD to prevent increase in anchor ice or freezing water rearing habitat.	Determine if AHMU prescription implemented in each unit.	Percent AHMUs Rx that have been implemented.	After harvest.	District Ranger.

Table 2-36 (Continued)
Monitoring Plan

Resource	Items to be Measured	How Measured	Unit of Measure	When Measured	Responsible Official
	Maintain fish passage for anadromous and resident fish.	Determine gradient of stream (Fig. 2-14).	Percent gradient of stream through culvert.	After construction of road crossing.	District Ranger.
	Protect spawning adults, including eggs and fry from disturbance during road building.	Determine number of AHMU class I road crossings constructed in and outside timing.	Percent road crossing on class I streams constructed outside timing.	Yearly.	District Ranger.
Recreation	Monitor changes in recreation experiences due to presence of roading and logging in the following areas if connection to road system exists: 1. Salt Lake 2. Salt Creek 3. North Saddle Lake 4. South Saddle Lake 5. Shelter Cove	Traffic counter (count number of people).	Changes in RVDs.	While road construction and logging are occurring. After activity is complete and access management plan is implemented.	District Ranger.
Visual	Planned visual quality objective.	Identify certain photo points in selected key viewsheds and observe and document impacts at different time intervals.	Comparison of visual objectives and visual condition attained for selected key viewsheds.	Before harvest. After harvest. Every 5 years thereafter, at least to year 20.	District Ranger.
	Effectiveness of slash treatments and revegetation in improving the natural appearance of newly constructed road corridors.	Observe and document appearance at different time intervals based on comparison to handbooks.	Percent improvement over untreated corridors.	Just after roadbed is in. After road and slash treatment finished and merchantable logs removed, and seeding complete. One year after completion. Five years after completion.	District Ranger.
	Whether slash removal methods in combination with harvest of	Identify certain harvest units, viewpoints, specific enhancement	Specific enhancement objective. One year after.	Just after roadbed is in and before harvest. After harvest and before slash	District Ranger.

Table 2-36 (Continued)
Monitoring Plan

Resource	Items to be Measured	How Measured	Unit of Measure	When Measured	Responsible Official
	selected units are successful in enhancing views from key recreation roads.	objective and technique to dispose of slash. Observe and document appearance at different time intervals.		removal. After slash removal and any seeding of roadside or landing area. One year after completion. Five years after completion.	
Subsistence	State provisions of the subsistence preference set forth in ANILCA Section 804.	Receipt of public comment on subsistence resources and uses and coordination with community fish and game advisory committees.	Public input reflecting need for customary and traditional uses of subsistence resources.	Annual ANILCA Section 806 Report to Congress as found in FSH 2609.25.	District Ranger in coordination with Subsistence Coordinator.

Chapter 3

Affected Environment

Chapter 3

Affected Environment

This chapter describes the environmental components of the area that would affect and that would be affected by the alternatives if implemented. It is important that the reader understand that this chapter describes what is, not what would be. The effects are included in Chapter 4, the Environmental Consequences section.

Soils

The development of both mineral and organic soils in southeast Alaska is influenced by high levels of rainfall, cool maritime temperatures, and moderately low yearly soil temperatures. The soils are found on a variety of terrain shaped by glaciation and characterized by U-shaped valleys with mountains extending 2000 to 3000 feet above sea level. Glacial till of varying thickness and deposition occurs in the valley bottoms and up to 1500 feet on the side slopes. Many of the valleys have numerous rocky knobs scoured by glaciers.

A level three inventory which identifies the soil types, their distribution and extent has been completed on the project area. Soil descriptions and pertinent soil references are available at the Ketchikan Ranger District Office. They include: the current Tongass Forest Plan Chapters 2 and 5; the Forest Ecosystems of Southeast Alaska; the Southeast Alaska Area Guide; and the Regional Guide Chapters 2 and 5.

Soils within the project area can be broken into three general groups: (1) mineral soils, (2) organic soils (Histisols), and (3) mineral or organic soils underlain by glacial till.

Mineral soils in this area predominately support coniferous forests, with the exception of alpine and estuary areas which support herbaceous vegetation cover. Soil drainage ranges from well to very poor, depending on soil type, with drainage greatly influencing overstory and understory vegetation composition. The surface organic horizons supply the bulk of the nutrients for plant growth.

Mineral soils occur on steep, glacially scoured, valley walls and steep mountain slopes and valley bottoms from the west side of George Inlet to Salt Lagoon, extending north, northwest and east. The soils have a wide range of characteristics depending upon the soil type and topographical features. Mineral soils located on steeper slopes are characterized by natural instability. Stability may decrease following surface disturbance such as road construction and/or logging. Gravity and running water are two dominant agents which cause natural erosion to exposed mineral soils. The rate of erosion depends primarily on the amount of vegetative ground cover and steepness of slope, but is also influenced by soil texture (percent of sand, silt and clay), amount and size of coarse fragments, and soil moisture content.

Slope stability is determined by soil strength, groundwater accumulation, slope gradient, and vegetation characteristics. Geotechnical properties of soils of landslides in coastal Alaska are quite variable for most soil mapping units.

Naturally unstable soils are common throughout the entire project area. Areas where high concentrations of very high mass movement index soils occur are:

- The north end of the project area along Carroll Inlet
- Approximately one-quarter mile northwest and south of Mahoney Lake.

Organic soils (Histisols) in southeast Alaska support either coniferous forest or herbaceous vegetation in open sites commonly referred to as muskegs (Bog meadows). Organic soils are found on approximately 40 percent of the project area occupying glacially-scoured benches and depressions on valley sides and bottoms, and on mountain side slopes. With one exception, organic soils are saturated or nearly saturated most of the year.

Organic soils possess a low mass movement index and have a low susceptibility for induced sediment production. Most of the organic soils have high compressibility and low shear strength. Areas dominated by organic soils are:

- Adjacent to Buckhorn Lake and extending north to South Saddle Lake.
- Approximately one mile south, southeast and southwest of Buckhorn Lake.
- Adjacent to North Saddle Lake, extending approximately one-half mile southwest and 3 miles north to the sale area boundary.

Soils composed of mineral or organic material underlain by glacial till occupy approximately 2 percent of the project area, a comparatively low percentage for the Ketchikan Area in general. Major concentrations of glacial till soils are:

- Approximately 100 acres one mile east of Buckhorn Lake.
- Approximately 400 acres one-quarter to one-half mile west of Beaver Falls Power Plant.
- Approximately 200 acres one-half mile north of Beaver Falls Power Plant.

Derivation of Soil Mass Movement Indexes

Soil Map Unit mass movement indices (MMI) were derived using a rating system that has been developed and revised over the last 14 years by soil scientists on the Ketchikan Area. This rating system evaluates seven major physiographic and soil criteria and their components. Mass movement indices are grouped into 4 classes relative to other soils: low, moderate, high and very high. For a detailed description of the rating system, refer to the KPC Long-Term Sale FEIS, Chapter 3.1.1. Table 3-1 illustrates acres of soils for each mass movement index class within the project area. A breakdown of areas of soil mass movement indexes by VCU is part of the administrative record and is available at the Ketchikan Ranger District.

Table 3-1
Areas of Soils by Mass Movement Index Class (MMI)

MMI Class	Acres[1]
Low and Moderate	41,094
High	16,111
Very High	3,178

[1]Acres represent calculations derived from soil map polygons.

Wetlands

Wetlands are those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of hydrophytic vegetative or aquatic life conditions for growth and reproduction. DeMeo

and Loggy (Forest Service Paper, unpublished) have classified wetlands on the Ketchikan Area. Land areas were determined wetlands when wetland diagnostic characteristics were present for all three parameters of soil, hydrology, and vegetation. Wetlands, once identified, were classified using the system developed for the Fish and Wildlife Service (FWS), U.S. Department of the Interior, by Cowardin et al. (1979).

Wetland functions include flood flow moderation, groundwater recharge and discharge, wildlife and fish habitat, and water quality protection. On the project area, wetlands are made up of forested sites on both poorly drained organic and mineral soils and open sites of herbaceous plants on organic soils (muskegs). Wetlands range from sea level to alpine. Estuaries are discussed under the Floodplains section in this chapter. Acres of wetlands are listed in Table 3-2.

Table 3-2
Acres by Wetland Class

Classes	Acres
1. Non-Wetlands	28,968
2. Wetlands[1]	
2a. Forested	21,000
2b. Muskegs	10,412
2c. Estuary	3
3. Total Wetlands	31,415
4. Total Sale Area[2]	60,383

[1]Acres represent calculations derived from wetland map polygons.
[2]This table does not include lakes.

Floodplains

Floodplains are usually built of sediments carried by the stream or river and deposited in the slack water section of the channel during periods of high water. Nutrient-rich sediments underlain by coarse textures make floodplains the most productive lowland timber sites on the project area. Major floodplain soils mapped at a scale of 1:15,000 within the project area include the following drainages:

- Upper Salt Creek drainage—Watershed # D80B
- Salt Creek drainage—Watershed # D81C
- Salt Lagoon Creek drainage—Watershed # D83A
- Shelter Cove/Nigelius Creek drainages—Watershed # D79A
- Gunsite Creek drainage—Watershed # D86A
- Buckhorn Creek drainage—Watershed # E50A
- White River and Mahoney Creek drainages—No designated watershed #

The floodplains on the project area typically are forested and dominantly support plant communities having an overstory of Sitka spruce and/or Sitka spruce and western hemlock. The shrub understory is variable and includes blueberry, skunk cabbage, devil's club, salmonberry, alders, and various mixtures of these. The herb understory is dominated by ferns and broadleaf plants of varying species.

Floodplains consistently influenced by tidal action are estuaries. Estuaries are generally, but not always, wet with moderately well to poor drainage. Vegetation is largely herbaceous, consisting of mountain hairgrass, beach ryegrass and sedges. Small knolls may support

Indian paint brush, shooting star, black lily and yarrow. Estuarine areas within the project area include the three creeks at Salt Lagoon, Leeks Creek, and very small areas within Coon and Shelter Coves.

Riparian Areas

Riparian areas (habitats) have distinct resource values and characteristics comprised of an aquatic ecosystem and riparian ecosystem. Aquatic ecosystems are stream channels, lake or estuary beds, water, biotic communities and the habitat features that occur within the bodies of water. Riparian ecosystems are the transition habitats between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristic or distinctive vegetation communities that require free or unbound water.

Under the new Tongass Timber Reform Act, protection of Riparian areas (habitats) shall be accomplished by maintaining a buffer zone of no less than one hundred feet in width on each side of all Class I streams and on those Class II streams which flow directly into a Class I stream, within which commercial timber harvesting shall be prohibited. Protection of riparian areas (habitats) on streams or portions of streams not protected by buffer zones, shall be accomplished through Best Management Practices (BMPs) as defined in R-10's Soil and Water Conservation Handbook (FHS 2509.22).

In southeast Alaska, riparian areas (habitats) are very variable in width and length in relation to stream classes and the different channel types within the stream classes. Very often they will be less than the width of the minimum 100 foot buffer, but in other cases they will be the width of an established buffer width.

Riparian ecosystems, where present in sufficient width, act as an effective filter and absorptive zone for sediment. They maintain shade, protect aquatic habitats, protect channel and streambanks, and promote floodplain stability. Buffering the riparian areas not only provides protection for the riparian areas, but also enhances the above characteristics of the riparian ecosystem in protecting and maintaining the stability of the aquatic ecosystem.

For this document, buffer zones are considered to coincide with Aquatic Habitat Management Units (AHMUs). The effects of road and harvest operations in the action alternatives on riparian areas should be the same as the effects shown for AHMUs in Chapter 4.

Hydrology

The water resource of the project area can be broken into five areas of consideration: (1) climate, (2) water conditions, (3) watershed characteristics, (4) special areas, and (5) water quality standards. Following is a brief description of the climate and weather of southeast Alaska. Refer to the KPC Long-Term Sale FEIS, section 3.1.5, for complete descriptions of the hydrology of southeast Alaska, including sections on climate, stream flows, water yields, runoff, typical hydrographs, sedimentation, water conditions, and water quality standards. These topics remain constant over the entire Ketchikan Area, therefore the information from the FEIS may be directly applied to the Shelter Cove project area.

Climate

The climate and weather in southeast Alaska have a strong maritime influence. Pressure cells produce strong winds and large amounts of precipitation when they meet the rugged coastline. Precipitation in southeast Alaska ranges from 90 to more than 200 inches per year. As a rule, clouds predominate over the area. Snowfall varies according to elevation and distance inland from the coast.

This Pacific maritime influence holds the daily and seasonal temperatures within a narrow range. Temperatures average 32 degrees in the winter and 60 degrees in the summer. Recorded temperature trends over Southeast are fairly uniform due to the fact that all the recording stations are at sea level.

Visual Resource

An assessment of the visual resource in this project area includes two components. The first describes recommended visual management objectives for the area known as inventoried visual quality objectives or VQOs.

The second component of this assessment describes the existing visual condition of the areas's landscapes. This describes what the landscapes look like now in terms of how much their natural character has been altered.

Inventoried Visual Quality Objectives (VQO)

The inventoried visual quality objectives for the area are recommended, measurable standards for managing the visual resource that are based on strictly scenic values—specifically the inherent scenic quality of the area (Variety Classes), and the concern people have for the appearance of the area's landscapes (Sensitivity Levels).

Variety Classes

A landscape's scenic quality is rated based on the degree of diversity, or variety of physical features that make up a landscape in its natural condition. Landscapes are rated as having distinctive, average, or low scenic quality (Variety Classes A, B, or C respectively).

The entire Shelter Cove project area is rated a Variety Class B, due to the generally rolling terrain or the broad rounded ridges that make up most of the area. However the Salt Lake basin with its steep prominent slopes, rock faces, grass meadows, and dramatic spaces stand out as one of the most scenic portions of this class B landscape.

Sensitivity Levels

The second factor in determining the inventoried visual quality objectives involves identifying recreation use areas, travel routes, communities and other key locations from which landscapes are viewed. A sensitivity level rating is assigned to these locations and the land masses seen from them based on the general frequency of use of these areas and the concern for scenic quality among the area's users. A Sensitivity Level I is assigned to the most sensitive use areas and the land masses seen from them. A Sensitivity Level II is assigned to moderately sensitive use areas. Sensitivity Level III applies to all land areas not seen from the use areas defined above.

In the Shelter Cove project area, a Sensitivity Level I is assigned to the waters of upper George Inlet, the Salt Lagoon and the land areas seen from these areas. A Level II is assigned to the less frequently used waters along Carroll Inlet and the land areas seen from this waterway. The above mentioned use areas represent those recognized by the present visual resource inventory.

With the implementation of this plan and the possible link of a Shelter Cove road system to Ketchikan, several other areas would be potentially sensitive. These include the road corridor itself, and the North Saddle Lakes and the Salt Lake areas because of their high recreation potential. These would all be rated a Sensitivity Level I. The Leask Lake area, from which some National Forest lands are visible, would be considered a Sensitivity Level I if a recreation area is developed there by the State of Alaska.

Visual Quality Objectives

Visual Quality Objectives (VQOs) are assigned to an area based on the relative importance of its different landscapes as measured by the scenic quality and sensitivity levels ratings discussed above. They allow for varying amounts of alteration of the natural landscape by various management activities such as timber harvest or roading. There are six different objectives that describe the full range of natural landscape alterations.

1. Preservation	No alterations to the landscape
2. Retention	Alterations are not evident
3. Partial Retention	Management activities are evident but subordinate to the natural landscape
4. Modification	Management activities may dominate the landscape, but are designed to blend with natural occurrences
5. Maximum Modification	Management activities dominate landscape and may only appear to blend in when seen from 5 or more miles away (background)
6. Unacceptable Modification	Is not an objective but describes a visual condition where management activity is out of scale with existing landform or other natural occurrences and does not blend in with the landscape

As part of the planning process for the Tongass Land Management Plan Revision (currently being worked on), a visual quality objective inventory of the project area was completed. The inventoried objectives in the areas seen from George Inlet and Salt Lagoon are retention in the foreground and partial retention in the middleground. Around these waterbodies most of the foreground is made up of State or Native land, and is not directly subject to National Forest management guidelines. The objectives in the areas seen from Carroll Inlet are partial retention in the foreground and modification in the middleground. Most of the rest of the project area that is affected by the different alternatives is inventoried as modification or maximum modification. Figure 3-1 in the Maps document displays these inventoried objectives for the whole project area.

Since the project proposes road development in the area that potentially could be linked to Ketchikan and access potential new recreation areas, a separate inventory has been completed that displays a new set of VQOs reflecting the new sensitive use areas. The VQOs along the major road corridor extending from the west side of the project area to Shelter Cove would be Retention in the foreground areas and Partial Retention in the middle ground. Similar objectives would apply in the potential recreation use areas such as North Saddle Lakes and Salt Lake. Figure 3-2 in the Maps document shows the new inventory. The bold boundaries define the land areas where the visual objectives change.

Existing Visual Condition (EVC)

An Existing Visual Condition Inventory of the project area has also been completed in conjunction with the Tongass Land Management Plan Revision process. This inventory describes the actual current condition of the landscape in terms that include "natural condition," "natural appearing," "slightly altered," "moderately altered," "heavily altered," or "drastically altered." The definitions of the different Existing Visual Conditions correlate very closely with those for the VQOs. (See Figure 3-3 in Maps document for an illustration of hypothetical examples of what the different VQOs and Existing Visual Conditions mean and how they are related.) Because of this close connection, the Existing Visual Condition Inventory can be used to compare the present condition of the landscape with the stated VQOs for the area. This inventory also helps assess the cumulative visual impacts of each alternative, in other words whether management activities will maintain the present conditions, lower the visual quality, or improve it.

The majority of the National Forest landscapes in the project area are in a natural or unaltered visual condition. The landscapes that have been modified have been altered either by the development of the Ketchikan Public Utilities transmission line that services the Swan Lake Project or by previous logging activities along Carroll Inlet. These areas are as follows:

1. Lands along the west shore of Carroll Inlet are in a slightly, moderately, or heavily altered condition.
2. Lands surrounding Salt Lagoon and west of the lagoon are in a moderately altered condition.
3. Lands encompassing the transmission line right-of-way east of Salt Lagoon and just above Leask Cove and Bat Cove are in a heavily altered condition.
4. Lands within the project area that are Native lands and have been harvested are classified as either moderately or heavily altered and have had significant impacts on some National Forest lands adjacent to them. (These acres are not reflected in the inventory and not shown in the accompanying acreage tables.)

Figure 3–4 in the Maps document displays the Existing Visual Condition Inventory for the whole project area.

Summary of Acreage Associated With Each Inventory

Table 3–3 summarizes the acres in each Existing Visual Condition and recommended VQOs. The VQOs reflect the present inventory displayed in Figure 3–1 in the Maps document. This data includes information for the entire project area excluding private and state owned land.

Table 3–3
Existing Visual Condition by VQO/EVC Class

VQO/EVC Class	Visual Quality Objective	Existing Visual Condition
Preservation (Natural Condition)	0	52,765
Retention (Natural Appearance)	10,106	1,518
Partial Retention (Slightly Altered)	11,155	1,351
Modification (Moderately Altered)	18,726	918
Maximum Modification (Heavily Altered)	20,397	3,832

Key Viewsheds

To assess the visual impacts of each alternative, a set of key viewsheds have been identified. These viewsheds are highlighted in Figure 3–5 which are displayed in the Maps document. They consist of the following areas.

Existing Viewsheds (recognized in present inventory)

1. Slopes around Salt Lagoon.
2. Carroll Inlet from just north of Shelter Cove to Hume Island.
3. North end of George Inlet above Leask Cove.
4. The southwest facing ridge west of Salt Lake that can be seen from the upper Naha River area.

Additional Potential Viewsheds (resulting from plan implementation)

5. The road corridor proposed in each alternative that leads from upper George Inlet to Shelter Cove.
6. The viewsheds around Salt Lake and along Salt Creek.
7. The viewshed around the North Saddle Lakes area (both large and small lake).
8. Leask Lake—(small portion of the viewshed is National Forest land, and is a potential future recreation area).

Recreation

Recreation Opportunities

The project area offers recreation opportunities usually found in a southeast Alaska primitive environment, including picnicking, camping, hunting, salt and freshwater fishing, hiking, boating, nature study, and other activities. The opportunities available are based on no recreation development in the area. However, different landscapes and levels of development can provide settings which support different types of recreation activities. Supplying these settings, therefore, makes recreation opportunities available.

Recreation resources were inventoried using the Recreation Opportunity Spectrum (ROS) which defines and inventories outdoor recreation environments and experience opportunities of a geographic area. It assumes that quality outdoor recreation is assured through the provision of a diverse set or spectrum of opportunities. Opportunities as defined in the ROS range from primitive, in which opportunities for isolation, risk, and self reliance are high; to urban, in which group activities and competitive sports are prevalent with no opportunity for isolation, risk, or self reliance. An in-depth description of ROS can be found in the Region 10 ROS Handbook 1909.12. The following is a brief summary.

1. Primitive I—An essentially unmodified natural environment 5,000 acres or larger that has no evidence of the sights and sounds of humans.
2. Primitive II—An essentially unmodified natural environment that has minimum evidence of the sights and sounds of humans.
3. Semi-Primitive Non-Motorized—A predominantly natural or natural appearing environment 2,500 acres or larger in which human presence may be evident.
4. Semi-Primitive Motorized—A predominantly natural or natural appearing environment 2,500 acres or larger in which human presence is evident and motorized use is permitted.
5. Roaded Natural—A natural appearing environment in which human presence and resource use is evident.
6. Roaded Modified—A predominantly modified environment in which resource use and modification are dominant.
7. Rural—A substantially modified natural environment in which resource modification and use are to enhance recreation activities.
8. Urban—An urbanized environment with natural appearing elements in which resource related activities are to enhance recreation activities.

Figure 3-6 in the Maps document shows most of the affected areas have a designation of either Roaded Modified or Semi-Primitive Non-Motorized. Table 3-4 displays the existing acreage of each ROS Class.

Table 3-4
Existing Acreage of ROS Classes

ROS Classes	Acres
Primitive I	4,662
Primitive II	696
Semi-Primitive Non-Motorized	36,217
Semi-Primitive Motorized	2,200
Roaded Natural	1,626
Roaded Modified	14,977
Rural	0
Urban	0

The ROS inventory classifies the entire project area, but it does not classify specific recreation areas or sites. These opportunities may differ depending on a variety of factors including access, scenery, facilities present, fishing potential, and other attractive features. For this reason, specific areas with unique recreation opportunities or high-value potentials are identified in the list below. Figure 3-7 in the Maps document indicates the location of these areas.

1. Heckman and Patching Lakes: Primitive II, existing recreation cabins and lakes with sport fishing. This is an area adjacent to the project area.
2. Salt Lagoon: Roaded Modified, diverse steep mountain scenery with muskeg and old-growth spruce flat, sport fishing, and a potential for dispersed camping on State land.
3. North Saddle Lake: Semi-primitive Non-motorized, potential for day use and/or campground with flat topography, potential loop trail system around both lakes, sport fishing could be developed and/or potential for a boat ramp on the large North Saddle Lake.
4. South Saddle Lake: Semi-primitive Non-motorized, sport fishing, potential recreation cabin, three-sided shelter, or dispersed camp sites with connecting trail from the road system.
5. Salt Lake and Salt Creek: Semi-primitive Non-motorized, potential for dispered camp sites, cabin, or three-sided shelter; sport fishing could be developed along with fishing access trails to the lake and along the creek; possibilities for a trailhead and trail around Salt Lake, eventually tying into the Naha trail system, exist.
6. Shelter Cove: Roaded Modified, good anchorage with potential for boat ramp and dock, dispersed camp sites and/or day use picnic areas accessible from both the road and beach..

The Naha River area which encompasses Heckman and Patching Lakes was legislatively designated a LUD II (Land Use Designation II) area in December, 1990. This area will continue to be managed as a Primitive II area. There is also a potential for development of a trailhead and trail off the proposed road system that could access the Naha River area and associated cabin system from the upper Waterfall Creek area.

The saltwater areas next to the project area, including parts of George Inlet and Carroll Inlet, support power boating, kayaking, canoeing, fishing and beachcombing. The inland waters provide sheltered anchorages in the more protected areas. One such area that has been identified is an existing anchorage at Bat Cove near Leask Cove.

Recreation Demand

Use figures estimated from previous years and studies conducted in the past help to develop a representation of the existing demand. This information, coupled with demographic (population statistics) trends, creates the future recreation demand.

The Forest Service maintains recreation activity use-figures through the Recreation Information Management System (RIM) on a yearly basis. The use-figures for the Ketchikan Ranger District in 1989, show a relatively even distribution of use for picnicking, camping, hiking/walking, recreation cabin usage and saltwater and freshwater fishing. The total recreation visitor days for the Ketchikan Ranger District was 94,900, representing all recreation activities in the area.

The Alaska Public Survey (APS) conducted in 1979, through a multi-agency effort, including USDA Forest Service, the Bureau of Land Management, the National Park Service, and the State of Alaska, is a comprehensive survey that analyzes the characteristics and attitudes of Alaskans toward their environment and their recreation use patterns. Information was collected by region, including the Southeast, by interviewing only Alaska residents. In 1983, another report was compiled by the University of Oregon, (called Marine Recreation in the Tongass National Forest), based on the information gathered in APS. The following are the findings from these reports and pertain to recreation planning and management in the project area.

1. Residents of southeast Alaska consider fishing, beachcombing/walking, and motorboating their favorite outdoor recreation activities.
2. Favorite coastal recreation activities include beachcombing/exploring, motorboating, and saltwater fishing.
3. Favorite upland recreation activities include driving for pleasure, hiking/walking, freshwater fishing, and target shooting.
4. The important characteristics of the outdoor recreation activities include being close to nature, getting away from the usual demands, keeping physically fit, and having more elbow room.
5. Reasons for visiting saltwater-related sites include fishing potential, knowledge of the area, remoteness, convenience, and scenery.
6. Reasons for not visiting upland recreation activity sites (besides weather) include not having enough time, not having the right equipment and transportation, activities cost too much, and not enough places available (also by car).
7. In addition to fishing, motorboating, and hunting, people in Ketchikan would like to do more camping (general, tent, backpack).
8. Residents also would like to have more opportunities for fishing areas, undisturbed natural areas, paths/trails, water access, and minimum facilities in these areas.
9. The Tongass National Forest around Ketchikan is used by almost half or more of the residents for backcountry cabin stays, picnicking/camping, hiking, fishing/hunting, and access by logging roads.
10. Residents expressed a desire for more campsites, picnic areas, and trails as well as better maintenance on all facilities.
11. Boating access and fishing areas close to the resident's communities were expressed as desired recreation improvements. The other most requested types of recreation areas were trails for non-motorized vehicles, natural areas, and hunting.
12. The strongest deterrents for visiting a desirable recreation area are new logging activities, new buildings, and new roads. All these activities represent a divergence from the natural environment.

13. In general, residents of southeast Alaska desire recreation improvements which provide easier access to the activities they enjoy as well as easier access to interior areas. New logging and road building can impact the users' enjoyment of their favorite areas. Alaskans are quite sensitive to the natural qualities and aesthetics of the environment in which they pursue outdoor recreation. If more people were to arrive at the recreation sites, the specialness of these favorite areas would no longer attract people to them. A possible strategy taking this into account would be to provide a variety of small developments rather than a few large ones.

Future local demand for recreation opportunities can be directly related to the potential population increases in the Ketchikan Gateway Borough. According to the recent (1988) Quartz Hill Molybdenum Project Mine Development Final Environmental Impact Statement, population will increase by approximately 1.2 percent per year as a baseline figure. If the Quartz Hill project is constructed and operated, the population will increase by approximately 3.1 percent per year over the next 20 years. These data indicate that resident recreation demand will continue to increase in the future as population increases. Results from the Alaska Public Survey also indicate that residents have an intolerance for crowding in their recreation places. With future steady population increases, the quality of recreation experiences may be perceived as being lessened for local residents.

Visitors from outside the local area who travel to Alaska and are not part of a package tour group (cruise ships) are termed independent travelers. A study funded by the Southeast Alaska Marketing Council and conducted by Data Decisions Group of Juneau found that independent travelers increased by twenty percent from 1985 to 1988. A portion of these travelers would be the type of visitors who would use recreation opportunities in remote areas or areas accessed by a road system. From this limited data we can predict that some general increase in visitation will occur and this in turn, will increase demand for road-accessed or remote recreation opportunities.

Land Status

Prior to 1971, the Ketchikan Area land base was fairly stable, with only minor changes taking place as land was removed for private homesites, canneries, townsites, and patented mining claims. However, beginning in the early 1970's, major land ownership changes were made as a result of several laws. Under terms of the Alaska Native Claims Settlement Act (ANCSA) of 1971, the village of Saxman and its corporation, Cape Fox, became eligible to select lands from the National Forest System within the Ketchikan Area. Most land conveyances have been made to the Cape Fox Corporation under ANCSA. The following table gives an indication of the land productivity in terms of timber production. Cape Fox is the only Native Corporation within the project area.

Table 3-5
Cape Fox Ownership

VCU	Total Acres	Operable Acres	Total CFL Acres	Volume Class 4	5	6	7
748	12,998	7,249	9,333	2,416	3,750	1,083	0
753	2,662	1,775	1,923	296	1,479	0	0
	15,660	9,024	11,256	2,712	5,229	1,083	0

The State of Alaska, under the Statehood Act of 1958, is entitled to select up to 400,000 acres from the National Forests in Alaska. To date, 77 percent of the selections have been made. Within the project area, State selection lands include the Upper George Inlet area within VCUs 747 and 748. The following table gives an indication of the land productivity in terms of timber production.

Table 3-6
State Ownership

VCU	Total Acres	Operable Acres	Total CFL Acres	Volume Class 4	Volume Class 5	Volume Class 6	Volume Class 7
747	2,950	1,424	2,543	509	915	0	0
748	5,265	3,309	3,309	601	2,332	376	0
	8,215	4,733	5,852	1,110	3,247	376	0

The following are private inholdings and Special Use Permits within the project area. See Tables 3-7 and 3-8.

Table 3-7
Private Inholdings

Survey Number	Acres	Management Area
1531 USS	3.03	K39
1579 MS	20.46	K39

Table 3-8
Special Use Permits

Name of Permittee	Acres	Legal Description	Management Area
Klukwan, Inc. (permit is for 4 mooring points)	.05	Sec. 6, T75s, R93E, CRM	K39

Transportation

The transportation system on Revilla Island consists of many small isolated road systems scattered around the island and located close to the shoreline. These road systems are under the jurisdiction of either the Federal Government, State, local governments, or private interests. Most of the roads managed by the Forest Service are isolated road systems and do not connect with the greater Ketchikan road system. These single lane Forest Service roads, constructed of shot rock, were built primarily for the purpose of timber harvest.

The Forest Transportation System includes three types of roads: (1) arterials, (2) collectors and (3) locals.

1. Arterials are primary roads which connect communities and provide the main access into the forest.

2. Collectors are secondary roads serving smaller land areas and generally provide the linkage between forest arterial, public or other forest collector roads, and the remainder of the road system.

3. Local roads serve as the terminal roads or provide minor linkages with the other roads.

Construction of roads for timber harvest activity varies from year to year on Revilla Island. In the past two years (1988–89), approximately 40 miles of road have been constructed by the Forest Service on Revilla Island. Arterial and collector roads are usually built and maintained to handle passenger vehicles and can normally be travelled at faster speeds than local roads. Also, many isolated arterial and collector roads are designed and constructed with the assumption that they may eventually tie into the greater Ketchikan road system.

The transportation system of the project area can be broken into four categories: (1) State and Municipal Roads; (2) Private Roads; (3) Forest Development Roads; and (4) Log Transfer Facilities.

State and Municipal Roads

There are approximately 58 miles of State roads administered and maintained by the Alaska Department of Transportation on Revilla Island. These miles are all within the greater Ketchikan road system, tying the north and south Tongass Highway and the Ward Lake/Harriet Hunt areas with Ketchikan. Due to the use of VCU boundaries to define the project area, 0.6 miles of State road are within the project area. These State road miles are not involved in any of the proposed alternatives in the project area. Local municipal roads (city) comprise about 19 miles, and are located outside the project boundary.

Private Roads

Revilla Island has many miles of road being constructed annually on private land, owned predominately by Alaska Native Corporations. Although the Forest Service does not keep data on the amount of road construction on private land holdings, there are some private roads that need to be addressed in this document. Within the project area there are approximately four miles of road owned by the Cap Fox Corporation that are involved in alternatives five and six. Agreements would have to be negotiated before the Forest Service could use these roads for timber harvest operations.

Forest Development Roads (FDR)

There are approximately 175 miles of existing Forest Development Roads on Revilla Island. Since most of the miles of FDRs are not tied to the greater Ketchikan road system, they are not maintained for passenger vehicles unless timber harvest operations are in progress in a particular area. Even then, these roads are designed primarily for heavy off-highway logging trucks. They are constructed with rough rock, and are mostly single lane with turnouts.

In the project area there are 7.6 miles of Forest Development Roads. Of these, 3.8 miles are linked to the Ketchikan road system and can usually accommodate normal passenger vehicles. The remaining 3.8 miles in the project area were constructed prior to 1970 using low-design standards and are currently overgrown and unusable. Also, about half of these low standard abandoned road miles are now located within the boundaries of State of Alaska selected land.

Figure 3–8 in the Maps document shows the existing roads on Revilla Island that are in the project area (except for unmapped private roads). Included are State, Municipal, FDR, and some private roads.

Log Transfer Facilities (LTF)

Due to the isolated road systems proposed by the alternatives, transportation of harvested timber from the project area to the mill at Ward Cove, Alaska, will require the use of log transfer facilities (LTF). Log bundles must be removed from the log trucks, placed into the

water and rafted to the mill. The building of additional road and transporting the timber by log truck to the mill is more expensive than rafting and towing. Therefore, log transfer facilities are used, and are proposed at several locations in the project area.

Figure 3-9 in the Maps document shows the location of existing log transfer facilities

There are presently three existing facilities within the project area, all are privately owned. (See table 3-9)

Table 3-9
Developed Log Transfer Facilities within the Project Area

Facility Location	Active Facility	Ownership
Coon Cove	yes	Cape Fox Corporation
Hume Island	yes	Cape Fox Corporation
White River	yes	Cape Fox Corporation

Timber

Old-Growth Timber

The forest of the project area extends from sea level to an altitude of about 2,000 feet. Most of the old-growth forest in the project area is undisturbed by people. The majority of the timber stands have a ragged texture because they include trees of various ages, sizes, and conditions, with many dead tops and snags. Stands within the project area disturbed during the last century or two by windthrow, fire, landslides, or logging have a more uniform appearance because they contain trees of relatively uniform age and size, with fewer snags and defective trees.

Soil drainage is important in governing species distribution and vigor in southeast Alaska. Well-drained soils offer the best growing conditions. Western hemlock and Sitka spruce account for 92 percent of the commercial forest land in southeast Alaska. The remaining 8 percent of commercial forest land is western redcedar, Alaska-cedar, and cottonwood (Harris and Farr 1974.)

Western hemlock is found throughout the project area from sea level to timberline. It is the most abundant tree species and comprises 64 percent of the total growing stock volume. Western hemlock occurs in dense stands in mixture with Sitka spruce, mountain hemlock, cedars, and other conifers.

Sitka spruce is the second most abundant timber species in the project area, making up 28 percent of the growing stock volume. It occurs throughout the area from sea level to timberline, occasionally in pure stands but more commonly in mixture with western hemlock, mountain hemlock, cedars, and shore pine. It is common along sea beaches, on or fringing tidal meadows, and as a pioneer species in mixture with alder, willow, and cottonwood.

The remaining timber in most stands, about 8 percent by volume, is evenly divided between western redcedar and Alaska-yellow cedar. Concentrations of the two cedars generally, but not always, are an indicator of poorer sites, primarily resulting from poor drainage.

Noncommercial species in the area include red alder and shore pine. Alder is found along beaches and streams, on snow avalanche slopes and landslides, and on roadsides and landings—wherever the soil has been highly disturbed. Shore pine, commonly called lodgepole pine by southeast Alaska residents, is found in muskegs and along beaches. Interspersed with forest stands are openings, hidden from view on the water but prominent from the air. These are muskegs or Bog plant communities growing on deep peat and

dominated by sphagnum mosses, water-loving plants such as sedges and rushes, and herbaceous shrubs. Muskegs are usually on flat or gently sloping topography but develop on steeper slopes as well. They provide suitable habitat for many plants with edible berries.

Between the muskegs and dense forest are more open forest stands growing primarily on organic soils. Stands of this type which contain less than 8,000 board feet of timber per acre are presently classed as noncommercial or "scrub" stands. Tree growth is slow, and tree form is often poor. Alaska-cedar, mountain and western hemlock, lodgepole pine, and Sitka spruce are important species in this forest community. The open canopy allows sufficient light to reach the forest floor to support dense understory vegetation of blueberry, huckleberry, rusty menziesia, other tall shrubs, and numerous small vascular plants.

Commercial Forest Land

Land suitable for the production of timber is classified in terms of volume per acre. The following table displays the volume class (VC) breakdown used in this project.

Table 3-10
Volume Class Breakdown

Volume Class	Thousand Board Feet per Acre
4	8–20
5	20–30
6	30–50
7	50+

The following table displays a breakdown of the project area land base in terms of Non-Commercial Forest Land (Non-CFL), Commercial Forest Land (CFL) and Second-Growth Timber.

Table 3-11
Forest-type Breakdown

Forest Type	Acres	Percent of Total Land Base
Non-CFL	29,638	49%
CFL	29,372	49%
Second Growth	1,373	2%
Total	60,383	100%

The following table displays the breakdown of commercial forest land within the project area by volume class.

Table 3-12
Commercial Forest Land by Volume Class

Volume Class	Acres	Percent of Total CFL
4	13,242	45%
5	14,525	50%
6	1,225	4%
7	380	1%
Total	29,372	100%

For management purposes, commercial forest land is classified by its ability to be logged. If the land can be logged it is termed operable. Operable land is either logged with standard logging systems or with nonstandard logging systems. For the purpose of this FEIS, normal operability is defined as those stands that can be harvested using the following standard harvest systems with their corresponding yarding distances: highlead up to 1,250 feet; short-span skyline under 1,000 feet; intermediate-span skyline from 1,000 to 2,000 feet; long-span skyline from 2,000 to 2,600 feet. Nonstandard logging systems are multi-span skyline, long-span skyline over 2,600 feet and helicopter.

Table 3-13 and Table 3-14 present a synopsis of the operable acres and operable volume prior to implementation of this project.

Table 3–13
Operable Acres in the Project Area

VCU	Total Acres	Total Old-Growth Acres	Total Operable Acres	Operable Acres by Volume Class 4	5	6	7
746	14,406	8,416	6,116	2,264	3,552	300	0
747	16,737	9,784	7,026	2,187	4,066	694	79
748	19,937	6,833	3,740	1,387	2,040	126	187
753	9,303	4,339	2,403	1,226	1,177	0	0
	60,383	29,372	19,285	7,064	10,835	1,120	66

Table 3–14
Operable Volume in the Project Area

VCU	Total Old-Growth Volume	Total Operable Volume	Operable Volume by Volume Class 4	5	6	7
746	210,974	155,863	39,010	106,421	10,432	0
747	256,950	189,149	39,246	121,799	24,147	3,957
748	172,896	96,289	21,453	61,110	4,387	9,339
753	100,685	57,619	22,358	35,261	0	0
	741,505	498,920	122,067	324,591	38,966	13,296

Existing Timber Industry

The southeast Alaska wood products industry consists of five sawmills, two pulp mills, numerous portable mills, and multiple logging operations on private and public land. Products manufactured for domestic and foreign consumption include dissolving pulp, dimension lumber, cants and flitches (rough sawn lumber meeting primary manufacturing requirements), and logs.

Alaska's dissolving pulp (special alpha grade) is an ingredient for rayon, cellophane and other specialized industrial and aerospace materials.

Logs from National Forest lands must undergo primary manufacturing into products such as chips or lumber. Alaska-cedar and western redcedar logs, however, may be exported if the Regional Forester declares them excess to domestic needs.

Since 1980, 13 Native Corporations in the region have exported logs from southeast Alaska. These log exports have to some degree displaced cants in the export market.

Pulp

About half the timber harvested from the Tongass National Forest is used for pulp. The Alaska Pulp Corporation (APC) mill in Sitka, an American company wholly owned by Japanese interests, and the Ketchikan Pulp Company mill near Ketchikan make up southeast Alaska's pulp industry. The Ketchikan Pulp Company mill has operated since 1951. The APC mill has operated since 1956, but was closed from July to October of 1985. This was due to poor markets and labor disputes.

Worldwide over the last decade, declining profits forced a number of less efficient producers of dissolving grades to close production facilities or convert them to making paper grades. The profit decline was due to excess capacity which forced market prices for the dissolving grades below sulphite and sulphate paper grades of pulp which are much cheaper to manufacture. The pruning which took place within the dissolving pulp industry and the subsequent global expansion in pulp demand has bolstered the market position of Alaska's pulp manufacturers.

Cants and Lumber

The capacity to produce lumber in the sawmill industry increased from 236 MMBF in 1987 to about 364 MMBF in 1988. The two sawmills producing lumber and cants for export last year are operating at higher rates than a year ago, and were joined by two more mills in 1988. The lumber and cant producers are Wrangell Forest Products, the Annette Hemlock Mill (a joint operation between the Annette Indian Reservation and KPC), the Chilkoot Lumber Company in Haines, and Klawock Timber Alaska, Inc. in Klawock. About nine smaller mills operate intermittently with a combined annual capacity of 36 MMBF. The average individual production level for the smaller processors is normally less than 1 MMBF of softwood logs. (Source: USDA Forest Service, Alaska Region; operator furnished data.)

Alaska's Timber Market

The forest products industry in southeast Alaska has four principal sources of timber: (1) forested lands of the Tongass National Forest administered by the USDA Forest Service, (2) timber inventory held by private corporations (principally Alaska Native Corporations formed through ANCSA), (3) timber sales of the State of Alaska, and (4) imported logs and chips. Federal timber is used to make dimension lumber, rough-sawn timber called cants and pulp. Some of the western redcedar and Alaska-cedar harvested on Federally administered land is sold (under exemption) as logs for export. Timber from private and State land is exported as logs or sold to local pulp mills. In strong markets, such as those in 1979 and 1980 and 1987 to present, lower grade timber from all ownerships can be sold to local pulp mills or chipped and exported as woodchips. In poor markets (1981 to 1987), however, this lower grade timber is not generally marketable and becomes surplus. (Source: Compiled from official statistics of the U.S. Department of Commerce, 1988.)

In addition to supplying domestic processors, Alaska's forest products industry exports high-quality pulp products which are competitive worldwide. In fiscal year 1988, Alaskan manufacturers exported $160 million in pulp products to 16 countries in Asia, Europe, and Latin America. The major markets for Alaska's output of softwood logs, cants, and lumber in fiscal year 1988 were Japan, South Korea, Canada, Taiwan, and China. Log exports were valued at $261 million and lumber shipped abroad in fiscal year 1988 was valued at $52.1 million. (Source: Compiled from official statistics of the U.S. Department of Commerce, 1988.)

In each product and foreign market, Alaskan manufacturers must compete with softwood producers from the Pacific Northwest, British Columbia, the Soviet Union, New Zealand, and Chile. In a variety of structural and decorative end-uses, Alaskan lumber manufacturers must also compete with hardwood suppliers spread throughout Southeast Asia.

Japan remains the largest importer of softwood products outside North America. In fiscal year 1988, Japan imported 48 percent of the value of Alaskan pulp exports, 81 percent of the value of log exports, and 93 percent of the value of lumber exports. The good export market for forest products has tightened supplies sufficiently that Alaskan producers are

finding markets for pulp-grade logs in British Columbia. (Source: Compiled from official statistics of the U.S. Department of Commerce.)

Over the last three years, markets in the Pacific Northwest have been established for Alaskan timber products. In addition, producers of semi-finished products (such as cants) have shifted some production to surfaced lumber cut to metric dimensions for the Japanese construction markets. Penetration into these markets characterized the industry's thrust to diversify and produce higher value-added products.

Fire

Few fires occur in the Tongass National Forest. The potential for large fires is quite low, but does exist because of heavy fuel loading and the occasional periods of low rainfall. May, June, and August have the lowest average monthly rainfalls. Burning conditions can occur at any time during this 4-month period, following a short dry period of approximately one week.

Timber harvest operations within the project area on private land (Cape Fox Co.) are converting areas of the forest from one fire fuel type to another. It takes two to three years for green slash to naturally abate to lower hazard conditions.

Air Quality

Air quality within the project area is generally rated as excellent. However, there are occasional short periods of time when man-made activities, such as prescribed burning, have temporarily lowered standards. Since 1984, a prescribed burn program has been conducted on the Ketchikan Ranger District. About 250 acres of logging slash have been burned each year for silvicultural, wildlife, and visual purposes. Although this activity has occurred outside the project area, prevailing winds have at times lowered air quality standards.

Cultural Resources

Cultural Resources include all evidence of past human-related activity, dating from the earliest beginnings to the fairly recent past. Very little systematic archaeological survey or excavation has been conducted within the boundaries of the study area, although it is likely that Revillagigedo Island has been utilized continuously for at least the past 5000 years.

Prehistoric sites bear evidence of precontact Tlingit land use or that of their prehistoric predecessors. The period of occupation theoretically extends from the late Pleistocene into the 18th century. Sites include subsurface archaeological deposits (shell middens, or buried sediments containing artifacts, charcoal, fire-cracked rock, etc.) as well as surface remains such as house depressions, cache pits, and stripped cedars.

The Shelter Cove project area is included in the traditional homeland of the Tlingit. Immediately prior to the time of European settlement, the study area was occupied by two Southern Tlingit groups, the Sanyakwan (also referred to as Saxman or Cape Fox) and Tantakwan (also referred to as Tongass or Ketchikan). The northern half of Revillagigedo Island was also apparently occupied at one time by the Xetlkwan (also the Hehl or Foam People) who more recently reside in the Wrangell area.

Historic sites are those that contain evidence of land use by post-contact inhabitants. The period of occupation extends from the 1790s into the 20th century. Frequently, historic sites contain surface evidence such as remains of residences or community buildings and durable artifacts made of ceramics, brick, glass, or metal.

To date, forty-four (44) cultural resource sites have been located or reported in or near the project area. Sites range from elevated fossil beaches which may contain clues to the earliest occupation of southeast Alaska and the population of the New World to Tlingit traditional resource areas and village sites and historic Euro-American settlement and use.

The majority of archaeological investigations connected with the project area have been cursory in nature, and no archaeological sites have been formally tested or excavated in the study area. However, indications are that the cultural heritage of Shelter Cove is rich and varied.

Virtually all sites would require evaluation to determine eligibility to the National Register of Historic Sites if endangered by project plans. The legal documents that address cultural resource evaluation and protection include The Antiquities Act of 1906, The National Historic Preservation Act of 1966 (amended 1988), The Indian Religious Freedom Act of 1978, and The Archaeological Resources Protection Act of 1979.

Fisheries

The waters of the Shelter Cove area, primarily the upper reaches of George Inlet and the west central portion of Carroll Inlet, support a diversity of fish and shellfish. This in turn provides sport and subsistence use opportunities for local residents, Alaskans from around the state and visitors from outside Alaska. The fishery resources are important to the economy and lifestyles of the area residents and to the many people who visit the area. The area helps support a significant commercial fishery. Important commercial and sport fish present in the area are pink, chum, coho, and sockeye salmon, steelhead and cutthroat trout, and Dolly Varden char (Edgington and Larsen 1977).

The salmon and trout are highly desirable sport fish and attract many visitors to Revilla Island. A recent survey of resident and non-resident Forest Service cabin users found that most people used the cabins for fishing. Most of the sport fishing is for anadromous salmon, primarily coho and sockeye, and steelhead trout. Anadromous fish spend at least part of their life in freshwater and part in saltwater. Salmon lay their eggs in the stream gravels, and the juvenile fish hatched from the eggs emerge from the gravels. Depending on the species of the salmon, the amount of time the juveniles spend in fresh water is variable. The pink salmon immediately start their downstream migration, while coho salmon juveniles may spend more than two years in fresh water before migrating to the ocean. The salmon reach maturity out in the ocean, only to return to their natal streams to start the cycle again. Resident trouts and chars spend all of their life in fresh water, spawning in the gravels of the streams of Shelter Cove, rearing to maturity in the streams and lakes of the area. Sport fishing for resident trout is concentrated around lakes and streams known to have good populations of resident fish and which have good access by boat from George or Carroll Inlet, as the lakes of the area are too small for air access.

It is common for several species of anadromous salmon and trout to use the same reach of stream for migration, spawning, and rearing. Where resident fish occupy the same reaches of the stream as anadromous salmonids, the resident trout are not found in large numbers. None of the watersheds within the planning area were identified as high quality sport fishing systems (AHMU Handbook, Forest Service 1986a). The primary sport fishing areas, or those of high potential are the Nigelius Creek watershed draining in Shelter Cove, and the Salt Creek watershed draining into Salt Lagoon. Many of the streams within the planning area have extensive fish passage barriers, reducing the number of anadromous fish that can be supported by the planning area waters (Edgington and Larsen, 1977). The total production potential of the watershed for pink and coho salmon is 225,000 pink salmon and 67,000 coho salmon. For the contribution of pink and coho salmon for each of the major watersheds see Table 3–15.

Table 3-15
Major Watersheds

Name	ADF&G # (101-45-)	Watershed # (0102-)	Length Miles	Area Sq. Mi.	Comments
Upper Salt Creek	10380	D80B	1.3	5.1	Major salmon producer in area Summer run coho. Prime wildlife area.
Salt Creek	10380	D81C	7.0	15.0	Major salmon producer in area. Summer run coho. Prime wildlife area.
Salt Lagoon Creek	10400	D84A	2.0	2.0	Pink and coho habitat in lower reach
Salt Lagoon Creek #2	10420	D83A	4.2	2.5	Pink, chum and coho spawning. 30 foot barrier falls at mile 1.0.
Head Coon Cove	10460	D03A	0.5	0.2	Small stream. Lower reach coho habitat.
TSA Cove	10440	D82A	1.5	1.0	Barrier falls on both forks limit access to lakes. Limited upstream habitat above 30′ barrier falls.
South Side Coon Cove	10480	E51A	1.7	1.0	10 foot barrier falls lower reach of stream.
East Side George Inlet	10500	E46A	3.5	5.0	Pink, chum, in lower of drainage (1/4 mile).
Carroll Inlet South of Hume Island	10590	E52A	2.5	2.0	Pink salmon spawning in lower 3/8 mile of stream. Coho fry found in stream.
Carroll Inlet Hume Island	10610	D75A	0.6	0.8	Pink spawning in lower reach. No coho fry found.
Carroll Inlet Osten Island	10640	E49A	3.0	3.0	Pink, chum in lower reach. 6′ barrier falls in lower reach of the stream.
Buckhorn Lake Creek	10670	E50A	3.5	5.0	Buckhorn Lake has stocked population of rainbow trout. Falls barriers in lower reach. Pink, chum, coho in lower reach. No enhancement potential due to numerous waterfalls.
Gunsite Creek	10730	D86A	2.5	0.9	Steep, deeply entrenched stream with minor anadromous fish potential.
Nigelius Creek	10750	D79A	3.0	5.0	Lower reach major producer of pink, chum, and coho. Both forks have barrier falls.

Fish Habitat

The fish habitat of the Shelter Cove area is classified in several ways, including: (1) watersheds, (2) stream classification units, and (3) Aquatic Habitat Management Units.

Watersheds

There are over 220 miles of streams within the project area. The area can be broken down into a number of watersheds. The objective of the breakdown is to evaluate various management activities on fish habitat and its capability to produce fish. Most of the watersheds within the sale area are small, usually about five to ten square miles, which drain directly into either George or Carroll Inlet. Most of these watersheds contain streams without names, except the Alaska Department of Fish and Game Anadromous Stream Catalog number. (See Table 3-15 on page 20 and Figure 3-10 in the Maps document.)

These major watersheds will be used as a relative measure of the various watersheds for the production of anadromous fish, and the environmental consequences of the proposed alternatives on the production capability of the watershed for the continued maintenance or enhancement of anadromous fish.

Stream Classification

The streams of the Shelter Cove area have been classified into different stream mapping units called channel types. The channel typing system developed on the Tongass National Forest stratifies watershed stream and lake habitats into distinctly different groups which are useful in inventorying and assessing watershed fish habitat production capability and sensitivity to management activities. The channel type groups found in the Shelter Cove planning area are based on physical characteristics of streams and predict their physical response to different management activities.

The channel types provide an inventory of the amount and quality of fish habitat within the Shelter Cove area. The amount and quality of rearing and spawning habitat predicted by the various channel types has been verified through field studies (Murphy, 1986; Bryant, 1986). The major channel types within the Shelter Cove project area are displayed in Figure 3-11 in the Maps document.

For planning purposes, channel types are grouped into nine broad categories called Stream Process Groups. Table 3-16 displays these stream process groups, the channel types contained in each process group, and the Stream Class (whether anadromous-Class I, resident trout-class II, or water quality-Class III). For a fuller explanation of Aquatic Habitat Management Unit (AHMU) Class for each of the categories see page 3-22.

Table 3-16
Stream Classification Mapping Units

Stream Process Groups	Channel Type Classification	AHMU Classes
Floodplain	B1, B1.4, C1, C1.4, C3, C3.4	I, II
Alluvial Fan	B5, A3	I, II, III
Mixed Control	B2, B3	I, II
Glide	L1, L1.4, L2, L3	I, II
Lakesides	L, LS	I, II, III
Estuarine	E1, E2, E3	I
Low Gradient Contained	C2,C5	I, II
Moderate Gradient Contained	B4, B6, B7	I, II, III
High Gradient Contained	A1, A2, A4, A5, A6, A7	II, III

For an in-depth description of stream process groups found in Shelter Cove see the 1989–94 Operating Period for the Ketchikan Pulp Company Long Term Sale Area FEIS, Volume 1, pages 3–81 to 83.

Mapped Streams

All mapped streams in the project area have been classified by channel type (USDA Forest Service). Draft Channel Type Classification Handbook, Chapter 20). A total of 220 miles of stream were channel typed, with over 47 of the miles being AHMU Class I. (See Table 3-17.) The channel type has served as the basis for aquatic habitat description, sensitivity, and the designation of the Aquatic Habitat Management Units (AHMU).

Not all streams within the project area are mapped by channel type. Streams not mapped are typically very small, but contain some valuable aquatic habitat. Streams not mapped during the classification process are referred to as ''unmappable'' streams and range from high gradient source streams to low gradient rearing streams.

Table 3-17
Stream Length of Process Group

Process Group	Miles
Floodplain	21.6
Alluvial Fan	4.1
Glide	9.9
Estuary	1.7
Mixed Control	28.7
Low Gradient Control	3.9
Moderate Gradient Control	24.6
High Gradient Control	126.0
Total	220.5

Aquatic Habitat Management Unit Designation

The Aquatic Habitat Management Units (AHMUs) are areas for management of the resources associated with the streams and lakes. The AHMU habitats represent a complex interrelationship between fish habitat and forest type, geology, soils, topography, and water quality.

The 100-foot zone adjacent to the stream encompasses most of the area of interaction between the fish habitat and the upland biotic and abiotic habitats. The AHMU is defined by the channel type based on the following physical features:

1. A minimum of 100 feet on either side of streams (FSM 2526.03 and FSH 2609.2a).
2. AHMUs will be expanded to include:
   A. Areas of unstable soil where numerous small to medium sized v-notch streams could significantly affect the quality of the fish habitat downstream.
   B. Floodplains, where lateral migration and/or multiple channel formation create numerous small rearing streams. On these floodplains, the AHMU will extend to the zone of influence of Large Organic Debris (LOD) and include areas where small rearing streams are present.
   C. Alluvial fan channels, which exhibit regular lateral migration, from their upstream source of departure from the valley constricted (singular, incised) channel type to the downstream confluence of the floodplain.
   D. Two hundred feet from the edge of lakes.

The distance on each side of the stream that is considered within the AHMU is listed in Table 3–18.

Table 3–18
AHMU Widths Along Streams

Channel Type	Stream Process	Distance (Ft.)	Channel Type	Stream Process	Distance (Ft.)
B1	Floodplain	100	B3	Mixed Contol	100
C1	Floodplain	300			
C3	Floodplain	500	C2	Low Grad Contain	100
			C5	Low Grad Contain	100
A3	Alluvial Fan	100			
B5	Alluvial Fan	200	B4	Mod Grad Contain	100
			B6	Mod Grad Contain	100
L1	Glide	100	B7	Mod Grad Contain	100
L2	Glide	300			
			A1	High Grad Contain	100
L	Lake	Shoreline	A2	High Grad Contain	100
LS	Lakeside	200	A4	High Grad Contain	100
			A5	High Grad Contain	100
E1	Estuarine	500	A6	High Grad Contain	100
E2	Estuarine	200			
E3	Estuarine	300			

Recognition of the width of the AHMU does not delineate an exclusive zone of no activity (no-cut). After they are delineated, management activities would be guided by prescriptions adopted in the Record of Decision.

AHMU widths are classified for the area according to the stream channel type that is present within a specific AHMU. The physical characteristics and channel type sensitivities, and upland management influences within the AHMU can be evaluated based on the inventoried conditions and responses of the channel types. AHMUs can be further subdivided into three classes. Class I, II, III designation will be based on fish presence. Fish presence is based on the channel type, position in the watershed, and known fish passage barriers.

1. Class I streams are anadromous or high-value resident sport fish streams. Additional fish habitat upstream of migration barriers with reasonable enhancement opportunities are included.
2. Class II streams have resident fish populations with sport fish value.
3. Class III streams have no fish populations, but have water quality influence on downstream fish habitat.

Table 3–19 displays the overall condition of the AHMU by process group when totaled for the project area. This display shows the relative amount of past harvest, the AHMU length in feet, amount harvested, and the percentage of the total AHMU acreage harvested.

Table 3-19
Status of AHMUs

	Total AHMU Acres	AHMU Acres Harvested	AHMU Length Harvested (Ft.)	% Acres Harvested
Floodplain	729	1.59	307	0.22
Alluvial Fan	61	0.00	0	0.00
Glides	231	0.00	0	0.00
Lakesides	960	0.00	0	0.00
Estuaries	0	0.00	0	0.00
Mixed Control	405	0.46	88	0.11
Low Gradient Contained	114	5.58	949	4.89
Mod Gradient Contained	455	3.39	653	0.75
High Gradient Contained	3,111	101.05	20,387	3.25
Total	6,066	112.07	22,384	1.85

Wildlife

Over 300 species of mammals, birds, amphibians, and reptiles occur on the Tongass National Forest. They occupy a diverse range of land types, plant communities, and special habitats. The species are equally diverse in their adaptability to climatic extremes, change in habitat, predation, and hunting pressure.

Public Use of Wildlife Resources

Game populations and other products of wildlife habitat supplement the diet of many residents of the Ketchikan Gateway Borough. The planning area lies within Alaska Game Management Unit 1A, which includes Revilla Island, Gravina Island, and the adjacent mainland.

Most hunting, trapping, and wildlife viewing on National Forest lands is limited to boat or float plane access within a 25-mile radius of Ketchikan. Wildlife habitats adjacent to saltwater beach and freshwater lakes receive the most intensive use.

Non-consumptive wildlife activities include non-harvesting activities such as feeding, photographing and observing fish and other wildlife. Wildlife associated recreation was one of this country's most popular forms of outdoor recreation in 1985, with 134.7 million Americans participating (USDI Fish and Wildlife Service 1988). Non-consumptive recreation, such as wildlife viewing, is becoming a significant pastime for both residents and non-Alaskans. Of 638 people that visited National Forest lands within the Ketchikan Ranger District, 56 percent stated that wildlife viewing and bird watching were important aspects of their favorite places to overnight (Evans et al. 1983).

Wildlife Habitat (Wildlife Habitat Management Units (WHMU))

Habitat Units are a system to classify all terrestrial and aquatic habitats of a forest on the basis of habitat relationships of the forest's management indicator species (Sidle and Suring 1986). An individual Habitat Unit is an area of land or water having potential to provide habitat for one or more management indicator species.

The Habitat Units are divided into 5 broad categories, Alpine, Subalpine, Beach Fringe, Riparian, and Upland Forest. WHMUs generally are characterized by their proximity to major geographical features.

The WHMUs most important to wildlife species were used to select areas for old-growth prescription. A combined habitat unit, entitled Deer Winter Range, has been identified specifically for the Sitka black-tailed deer. A brief description of each category follows.

Habitat Units

Alpine
The alpine category includes all stands above treeline, including unvegetated areas of permanent snow and ice; open habitats of grass, forb, and brush vegetation; and scrub forest (Sidle and Suring 1986). Alpine includes areas above 2,000 feet in elevation.

Subalpine
The subalpine category includes a mosaic of forested, scrub, and unforested stands that occur at higher elevation than the upland forest (Sidle and Suring 1986). Subalpine encompasses a 1,000-foot-wide strip of land surrounding the alpine.

Beach Fringe
This category includes land lying within 500 feet of the mean high tide and excludes estuarine habitat units. This category overlaps with deer winter ranges for Sitka black-tailed deer.

Riparian
The riparian category includes segments of streams, lakes, and estuaries along with adjacent areas that have fairly consistent physical characteristics (Sidle and Suring 1986).

Lakeside
This habitat unit includes land within 200 feet of lakes greater than 10 acres in size. Both lakeside and streamside are included in the Aquatic Habitat Management Units for analysis purposes in the Fisheries section of this document.

Streamside
This habitat unit includes the areas within the Aquatic Habitat Management Unit buffer for anadromous or resident fish streams (see Chapter 3 Fisheries Aquatic Habitat Management Unit definition).

Estuarine
This habitat unit encompasses a 1000-foot forested strip surrounding estuaries. This category overlaps with the deer winter range categories.

Upland Forest
This category includes all stands that are not contained in alpine, subalpine, beach fringe, or riparian habitat units (Sidle and Suring 1986).

Deer Winter Range (DWR)
Deer winter range includes lands within the area outlined by the following criteria:

a. Less than or equal to 800 feet in elevation on aspects from 135 to 225 degrees, and containing high-volume timber stands (volume class 5–7).

b. Includes areas that are known to be occupied by deer during severe winters, but that may not conform to the other criteria. TLMP maps and local ADF&G biologists are sources that have helped identify these locations.

Management Indicator Species (MIS)

Management Indicator Species (MIS) are species of vertebrates or invertebrates whose population changes are believed to indicate the effects of land management activities. The MIS are used to meet the requirements for maintenance of population viability and biological diversity and to assess effects on species in public demand.

The following species have been selected as Management Indicator Species for this project:

Species	*Rationale for Selection*
Sitka Black-tailed Deer	Important game species
Pine Marten	Diversity (old growth); important furbearer
Black Bear	Indicator or estuarine habitat and diversity; game species
Bald Eagle	Old-growth coastline; high public interest
River Otter	Represents riparian habitat; furbearer
Hairy Woodpecker	Cavity excavator
Vancouver Canada Goose	Represent old-growth and riparian habitats; game species

Sitka Black-tailed Deer

Sitka black-tailed deer was chosen as a MIS because it is an important game species and is seasonally dependent on old growth. Deer habitat is defined as deer winter range. For additional information on the Sitka black-tailed deer, please see the 1989–94 Operating Period for the Ketchikan Pulp Company FEIS (Chapter 3, pages 98–99).

Wolves prey primarily on deer on most of the project area and feed heavily on beaver when deer are scarce. Gray Wolf abundance usually parallels deer abundance, therefore, any activity affecting deer populations is assumed to have a similar affect on gray wolf populations.

Currently, deer populations are moderately high and increasing (Wood 1987 pers. comm.). Wolf predation may be limiting deer numbers (Smith et al. 1986). In most locales, deer forage is abundant and lightly browsed indicating that deer numbers are below their potential level.

Pine Marten

The pine marten was selected as a MIS to represent old-growth dependent species and because it is an important furbearer. Marten habitat is defined as lands within the upland forest, deer winter range, estuarine and subalpine habitats. For additional information on the pine marten, please see the 1989–94 Operating Period for the Ketchikan Pulp Company FEIS (Chapter 3, pages 99–100).

Marten are an important furbearing species and populations are moderate in the study area. Most trapping pressure is from trappers that operate from skiffs in Carroll and George Inlet. High pelt prices, susceptibility to trapping pressure and easy access to new trapping areas have created demand for pine marten.

Black Bear

The black bear was selected as a MIS to represent estuarine habitat and diversity. Although black bear utilize all available habitats, their use is seasonally concentrated within riparian, estuarine, lakeside, and beach habitats. Black bear habitat is defined as beach, streamside, estuarine, and lakeside. For additional information on the black bear, please see the 1989–94 Operating Period for the Ketchikan Pulp Company FEIS (Chapter 3, page 100).

Black bears are highly adaptable and can tolerate moderate disturbances, such as habitat alteration, as long as the basic requirements for food and cover are satisfied (Lawrence 1979). Black bears are currently common and populations are stable.

Bald Eagle

The bald eagle was selected as a MIS because the public has a strong interest in the species and the species requires special habitats. Bald eagle habitat is defined as beach fringe habitats. The majority of bald eagles in southeast Alaska nest in coniferous forest habitats along the coastline and associated saltwater inlets (Suring et al. 1988d). Eagles prefer to

nest in continuous stands of old growth rather than in narrow leave strips of old-growth trees. Of the 3,850 nests surveyed, 92 percent occurred within 300 feet of the shoreline (Hodges and Robards 1982).

Bald eagles nest adjacent to the habitat that provides the best opportunities for foraging such as over open water and on tidal flats. Eagles primarily feed on fish, but are also known to feed on waterbirds, marine invertebrates, and drifting carrion. Perching sites near the nest and foraging areas are also important components of the bald eagle habitat requirements.

There are 13 bald eagle nests in the planning area and 19 nests on adjacent private and State lands. The bald eagle and its habitat have been given special protection through the Memorandum of Understanding between the Forest Service and the U.S. Fish and Wildlife Service and the Bald Eagle Protection Act.

River Otter

The river otter was selected as a MIS to represent riparian habitats and because it is an important furbearer. River otter habitat is defined as beach fringe, anadromous streamside, and lakeside. For additional information on the river otter, please see the 1989-94 Operating Period for the Ketchikan Pulp Company FEIS (Chapter 3, page 101).

River otter harvests are increasing throughout Alaska with over 430 pelts taken in 1983–84 (Townsend 1986).

Hairy Woodpecker

The hairy woodpecker was chosen as a MIS because of its preference for stands of old-growth western hemlock and Sitka spruce and for its association with snags. Hairy woodpecker habitat is defined as volume class 4–7 stands below subalpine. For additional information on the hairy woodpecker, please see the 1989–94 Operating Period for the Ketchikan Pulp Company FEIS (Chapter 3, pages 101–102).

Forty-two species of mammals and birds in southeast Alaska nest or den in tree cavities. Included are woodpeckers, owls, hawks, waterfowl, bats, squirrels, marten, and others. Several of these species depend exclusively on cavities in the large diameter snags characteristic of old-growth stands for nest or den sites. Most cavity nesting or denning (bears, marten, squirrels, etc.) species would be represented by hairy woodpeckers and respond similarly to proposed activities.

Vancouver Canada Goose

The Vancouver Canada goose was selected as a MIS to represent old-growth and riparian habitat. The Vancouver Canada goose is also a game species. The Vancouver Canada goose habitat is defined as anadromous streamside, lakeside, and estuary habitats. For additional information on the Vancouver Canada goose, please see the 1989–94 Operating Period for the Ketchikan Pulp Company FEIS (Chapter 3, page 102).

Banding studies have indicated Vancouver Canada geese are primarily non-migratory (Ratti and Timm 1979 in Lebeda 1980) and are found almost exclusively in southeast Alaska.

Potential Management Species Eliminated from Consideration

Marbled Murrelet

The marbled murrelet is listed as a category 2 species by the U.S. Fish and Wildlife Service (1989). Category 2 comprises taxa (taxonomic groups) for which information in possession of the U.S. Fish and Wildlife Service indicates that proposing to list the species as endangered or threatened is possibly appropriate, but conclusive data on biological vulnerability and threat are not currently available to support proposed rules (U.S. Fish and Wildlife Service 1989). For additional information on the marbled murrelet, please see the 1989–94 Operating Period for the Ketchikan Pulp Company FEIS (Chapter 3, pages 103–104).

Endangered and Threatened Species

No known endangered or threatened wildlife species occur in the planning area (U.S. Fish and Wildlife Service 1989). The endangered Arctic and American subspecies of the peregrine falcon nest farther north, but could pass over the project area during migration. The Peale's subspecies of the peregrine falcon are not known to nest in the planning area (Schempf 1981, 1982). This subspecies is not listed as endangered or threatened, but is covered by a provision of "similarity of appearance" which broadens the scope of protection for all Peregrine Falcons (USFWS—Alaska 1984). Humpback whales are occasionally found in waters bordering the planning area (VTN 1982). A biological assessment has been prepared for the humpback whale (Green 1987) and a letter of concurrence was written by NMFS (McVey 1987). No effects to the humpback whale are expected from the project.

Subsistence

Many Alaskans depend upon hunting, fishing, and gathering of plants and materials as part of their livelihood. To more than half of the population residing in urban areas, hunting, fishing, and gathering activities represent a major focus of life.

Subsistence activities are conducted for a variety of reasons such as a means of continuing a way of life, maintaining and continuing a cultural heritage, and because of economic necessity.

The importance of subsistence is recognized in both State and Federal laws. The most important Federal law dealing with the subject is Title VIII, Section 802 of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980. Under the terms of ANILCA, subsistence is defined as "the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct, personal, or family consumption as food, shelter, fuel, clothing, tools, or transportation."

Section 810(a) of Title VIII requires that federal managers determine whether subsistence will be significantly restricted by a proposed action before that action is undertaken. If it appears that the proposed action could significantly restrict subsistence uses, certain measures must be taken before proceeding with the project. One of the measures to be taken is holding formal public hearings.

A Section 810 evaluation cannot be made without an inventory of existing potential subsistence resources and their level of use.

Inventory information for this project was gathered from (1) informal contacts, (2) formal subsistence studies, and (3) the Alaska Department of Fish and Game.

In 1988, a detailed subsistence resource and use inventory of the Tongass National Forest was started as part of the TLMP Revision. Called the Tongass Resource Use Cooperative Survey (TRUCS), the inventory was a cooperative study conducted by the U.S. Forest Service, ADF&G, and the Institute of Social and Economic Research, University of Alaska, Anchorage.

In the TRUCS, researchers went to over 30 communities in southeast Alaska and conducted interviews with randomly selected households about their 1987 subsistence uses. As part of the interview, household residents were also asked to draw special maps of the areas used for hunting and fishing.

The results of the interviews were tabulated and compiled by community and a report prepared for each community included in the survey. The reports were distributed in September 1988.

Map production from the survey began in the fall of 1988, and is not expected to be completed until the summer of 1990.

Readers interested in a complete description of how the survey was conducted can consult Tongass Resource Use Cooperative Survey Technical Report Number One from the Institute of Social and Economic Research, University of Alaska.

Affected Areas and Resources

The Shelter Cove project area covers 84,894 acres in and around Shelter Cove and Upper George Inlet. The Alaska Department of Fish and Game, for record keeping purposes, has broken State of Alaska Game Management Units (GMUs) into smaller areas called Minor Harvest Areas. All VCUs within the project area are located in Minor Harvest Area 407 and that portion of 406 west of Carroll Inlet. Harvest data on several commonly used subsistence species was made available for the project area by ADF&G. Additional information was made available through the TRUCS report. ANILCA gives priority consideration to rural communities should it prove necessary to restrict the taking of fish and wildlife in southeast Alaska. Because of their proximity to the project area, Saxman and Metlakatla have been evaluated. Tourists and other non-residents of Alaska are not eligible for subsistence uses.

Tables 3-20 and 3-21 present information taken from the 1988 TRUCS reports detailing subsistence use for the communities of Metlakatla, Saxman, and Thorne Bay.

Table 3-20
Household Subsistence Harvest, 1987 (Mean Edible Pounds Harvested)

Community	Deer	Moose	Goat	Black Bear	Fur-bearers	Marine Mammals	Salmon	Finfish	Shell-fish	Water-fowl	Greens
Metlakatla	40	0	0	0	0	3	75	61	60	7	0
Saxman	56	18	0	0	0	8	113	60	35	1	0
Thorne Bay	112	6	1	11	0	0	146	227	57	5	1

Table 3-21
Role of Subsistence in Community Lifestyles

Community	Pounds Harvested Per Capita	Number of Resource Types Harvested	Number of Resource Types Received
Metlakatla	71	4.2	5.8
Saxman	90	5.2	5.7

Metlakatla households reported an average of 71 pounds of edible meat and fish harvested per capita in 1987. Saxman households reported an average of 90 pounds of edible meat and fish harvested per capita in 1987.

Each subsistence use community used different types of resources. This is because environments around each community vary. The types of resource indicated, for example, were deer, king salmon, beach greens etc. In the TRUCS report researchers included about 42 different types of subsistence resources. Metlakatla residents harvested on an average about 4 different types of resources. Saxman residents harvested on an average about 5 different types of resources.

Sharing subsistence products is an important part of subsistence uses of fish and game. Residents surveyed for the TRUCS study were asked the different types of resources each received from some other household. For Metlakatla and Saxman the average number of different resources received in 1987 was almost 6.

Table 3-22 below, taken from the 1988 TRUCS report, shows the proportion of total pounds of edible subsistence resources that come from each type of subsistence resource for Metlakatla, Saxman, and Thorne Bay.

Table 3-22
Percent of Total Pounds of Edible Subsistence Resource for Metlakatla, Saxman, and Thorne Bay

Resource	Region	Metlakatla	Saxman	Thorne Bay
Salmon	27	29	37	25
Deer	21	15	19	20
Other Finfish	24	23	20	40
Invertebrates	16	23	11	10
Other Mammals	7	2	9	3
Other	5	8	4	2
Total Percent	100	100	100	100

Table 3-22 is specifically for Metlakatla, Saxman, and Thorne Bay for example. The Region column represents rural southeast Alaska as a whole. Table 3-22 shows that invertebrates (e.g., crab, shrimp) and other resources are relatively more important to Metlakatla residents, that salmon and fish other than salmon are of about the same importance, and that deer and other mammals are relatively less important. Table 3-22 also shows that salmon are relatively more important to Saxman residents, that other mammals and other resources are of about the same importance, and that deer, fish other than salmon, and invertebrates (e.g., crab, shrimp) are relatively less important.

The following section deals with the general activities on the project area by individual resource. (Harvest data is taken from ADF&G game harvest records.)

Fish

Salmon, trout, and some ocean dwelling bottomfish are the principal subsistence fish resources in the affected area. Pacific salmon, with the exception of Chinook, are harvested in both fresh and salt water in a variety of ways throughout the year. The sockeye salmon is probably the most important subsistence species because of its high quality flesh and ease of harvest at traditional sites.

Subsistence harvest sites for salmon within the project area include:

- Leask Cove
- Salt Chuck
- White River
- Nigelius River
- George Inlet

The State of Alaska issues personal use permits for the taking of several species of salmon for personal consumption. Table 3-23 summarizes the permit information for the project area for the period 1981-87.

Table 3-23
Salmon Personal Use Permits and Harvest, 1981-87

Location	Permits Issued	Salmon Taken *Sockeye*	*Pinks*	*Chums*
1981				
White River	29	0	92	0
George Inlet	2	0	50	0
1982				
White River	1	0	20	0
1983				
White River	2	0	0	10
1984				
White River	6	0	47	10
Nigelius River	2	0	30	0
1985				
Leask Cove	3	20	19	1
George Inlet	2	3	0	0
1986				
No Permits Issued				
1987				
Leask Cove	40	59	37	0
Salt Chuck	3	0	0	0

Deer

The Sitka black-tailed deer is an important subsistence species found throughout the study area. The general hunting season is August through late November. Harvest is generally concentrated during two time periods, the first few weeks of the season in August, and later in November when the rut occurs. Data from the ADF&G harvest records indicates that Ketchikan is the home of the largest number of hunters in Minor Harvest Area 406 and 407. The 1988 deer hunter survey did not sample anyone from Saxman or Metlakatla who hunted in MHA 406 or 407. This does not mean hunters from Saxman did not harvest deer within the project area. The reason for this is that many Saxman residents have Ketchikan addresses. Table 3-24 displays harvest statistics for Sitka black-tailed deer for MHA 406 and 407. The data for MHA 406 includes that portion west of Carroll Inlet only.

Table 3-24
Deer Hunter Survey for Minor Harvest Area 406 and 407 for 1988

MHA	Number of Hunters	Number of Succes.	Total Hunter Days	Total Deer Killed
406	69	26	158	34
407	270	72	1,066	104
Total	339	98	1,224	138

The 1988 data year is used because this is the highest harvest level over recent years.

Black Bear

The TRUCS effort indicated that some black bear harvest was associated with subsistence use, but that community use varies widely. The ADF&G has gathered harvest data for many years through its sealing program. Table 3-25 displays the black bear harvest for Minor Harvest Area 406 and 407. The data for MHA 406 includes that portion west of Carroll Inlet only.

Table 3-25
Black Bear Harvest by Year for Minor Harvest Area 406 and 407

MHA	1982	1983	1984	1985	1986	1987	1988
406	2	0	5	2	6	3	1
407	1	6	4	1	2	5	4
Total	3	6	9	3	8	8	5

Furbearers

Furbearer harvest supplements the seasonal income of many subsistence users. Different levels of trapping intensity exist, from the occasional trapper who targets primarily pine marten and beaver, to those individuals pursuing all furbearers. Harvest effort is usually concentrated along the salt water-upland interface, and near or along major river systems. Pine marten appear to be the most old-growth dependent of the furbearers.

Tables 3-26 through 3-27 display the pine marten, beaver, and river otter harvest for minor harvest area 406 and 407. The data for MHA 406 includes that portion west of Carroll Inlet only.

Table 3-26
Beaver, Pine Marten and Otter Harvest for Minor Harvest Area 406

Species	85/86	86/87	87/88
Beaver	1	9	10
Pine Marten	6	7	8
Otter	2	3	4
Total	9	19	22

Table 3-27
Beaver, Pine Marten and Otter Harvest for Minor Harvest area 407

Species	85/86	86/87	87/88
Beaver	1	14	7
Pine Marten	1	13	0
Otter	2	7	0
Total	4	34	7

A wolf and wolverine season is usually open from November 10 to April 30, with the most active trapping occurring in December. The wolf trapping success for the seasons 85/86, 86/87, and 87/88 was 0 wolves, 1 wolf, and 2 wolves, respectively, for MHA 406, and 5 wolves, 1 wolf, and 0 wolves, respectively, for MHA 407.

Chapter 4

Environmental Consequences

Chapter 4

Environmental Consequences

This chapter describes the changes to the environment that are likely to occur with the implementation of any of the alternatives. Each resource is discussed individually. Integrated watershed resource concerns are summarized.

Issues identified in scoping were soil mass movement and water quality.

Soils

Natural erosion within the project area occurs mainly through mass movement events. Timber harvest activities and road building can temporarily increase erosion and stream sedimentation above natural levels in watersheds. Increases occur where mineral soils are exposed to the water erosion processes, causing increased nonpoint source pollution and loss of soil productivity.

Two forms of erosion may be accelerated by timber harvest activity:

- Mass movement events (landslides) may be triggered by (1) windthrow along cutting unit boundaries, (2) soil disturbance through felling and yarding activities, and (3) road building activities such as blasting, excavating slope support, overloading slopes by side casting, and directing and accumulating water.
- Sheet, rill, and gully erosion on exposed mineral soil caused by felling and yarding activities, road surfaces, cutbanks, and borrow pits.

Proper timber harvest planning and administration, in addition to the application of Standards, Guidelines, and Mitigation Measures (Chapter 2.5) can minimize soil disturbance and subsequent erosion. While soil disturbance can be minimized, it cannot be completely eliminated. Most disturbances can be reduced to short-term impacts (5 years or less), ranging in length from a few hours of sedimentation during bridge construction to stabilization of a landslide which can take up to five years and longer.

Long-term impacts from timber management activities on soils include:

- Loss of productive soil base (roads remove land from the productive soil base so long as they remain permanent).
- Impaired soil productivity for commercial timber caused by borrow pits and landslides.

The Ketchikan area adopted Swanston's methodology outlined in the EPA's (1980) nonpoint source pollution handbook to evaluate landslide hazard on a project basis. A Mass Movement Index rating system was devised to assign a Mass Movement Index to each soil map unit. (See KPC 1989-94 EIS Chapter 3, page 5 through 7 for discussion of the Mass Movement Index rating table.) Information from the Mass Movement Index rating was used to identify units requiring field investigations.

4 Environmental Consequences

Evaluation Factors

Six factors are used to evaluate the effects of timber harvest and road construction by alternatives: (1) total acres proposed for harvest, (2) acres of harvest on high and very high Mass Movement Index (MMI) soils, (3) harvest by suspension requirements on high and very high MMI soils, (4) miles of road construction, (5) miles of road construction on high and very high MMI soils, and (6) total acres disturbed on high and very high MMI soils. A description of each of the factors and their significance to erosion is discussed below (see Table 4-1).

Total Acres Harvested

The total acres harvested provides a means of comparing the amount of soil subject to potential disturbance from harvest activities, which is an indicator of increased surface erosion and productivity loss.

Of the action alternatives, Alternative 2 includes the fewest acres of harvest. Alternative 4 includes the greatest amount of harvest acres. Alternatives 6, 5, and 3 rank from second through fourth in terms of amount of acres harvested in decreasing order.

Acres of Harvest on High and Very High MMI Soils

Acres of harvest on high and very high MMI soils compare the amount of harvest on soils more sensitive to erosion. In conjunction with steep slopes and periodic high water tables, mass movement events are influenced by loss of root strength of harvested trees, disturbance from timber falling operations, and windthrow along the cutting boundaries. Table 4-1 presents acres proposed for harvest occurring on high and very high Mass Movement Index soil, by alternative, with percentage of total proposed harvest for each alternative.

Table 4-1
Total Acres Harvested (Percent of Total)

	Alternatives					
	1	*2*	*3*	*4*	*5*	*6*
High MMI	0 (0)	814 (37)	981 (44)	1,326 (37)	1,161 (44)	1,333 (44)
Very High MMI	0 (0)	24 (1)	32 (1)	210 (.5)	33 (1)	<1 (<.01)

Alternative 6 includes approximately 1,333 acres of harvest on high MMI soils. Alternatives 4, 5, 3, and 2 include approximately 1,326, 1,161, 981, and 814 acres, respectively.

Alternative 4 includes approximately 210 harvest acres on very high MMI soils, the greatest amount of all the action alternatives. Alternatives 5, 3, 2, and 6 include approximately 33, 32, 24, and less than 1 acre on very high MMI soils, respectively.

Harvest by Suspension Requirements on High and Very High MMI Soils

The type of logging system and suspension requirements for yarding the timber on high and very high MMI soils influences the amount of soil disturbed during yarding operations.

In general, yarding operations on high MMI soils will require one end of the log to be suspended. On very high MMI soils full log suspension will be required. Sites with very high MMI soils range from small incidental areas scattered throughout a harvest unit to sites with several acres in other harvest units. Appendix B contains tables displaying acres of high and very high MMI soils by harvest unit by alternative.

Most yarding operations result in about 10–20 percent of the mineral soil being bared. However, it is possible to reduce the surface disturbance to less than 5 percent, thereby minimizing human-induced erosion by using logging systems capable of achieving partial and/or full suspension of logs during yarding.

To estimate the effects of yarding on high and very high MMI soils, it is assumed (from data gathered in disturbance transects) that yarding with partial suspension would bare a maximum of 10 percent of the soil area and that yarding with full suspension would bare 5 percent or less of the soil area.

The acres harvested by suspension requirements on high and very high MMI soils in each alternative are listed in Table 4–3. Alternative 2 is expected to create the least amount of soil disturbance (82.6 acres) on high and very high MMI soils due to yarding operations. Alternative 4 is expected to create the greatest amount of soil disturbance (153.6 acres) on unstable soils, followed by Alternatives 6, 5, and 3 with 133.4, 117.8, and 99.7 acres of disturbance, respectively. These figures were derived by multiplying disturbance factors applied to partial and full suspension yarding (0.10 and 0.05, respectively) to acres of soils having high or very high MMI and adding these values to obtain total acres of disturbance on high and very high MMI soils.

Miles of Road Construction

Total miles of road construction provide a means of comparing the amount of disturbance caused by roading, which is an indicator of productivity loss. There is far greater mineral soil disturbance as a result of road building activities than timber harvest operations.

In contrast to timber harvesting operations where bared soils are dispersed over large areas which lessens the impacts, road disturbances are concentrated along a corridor which remains disturbed for a longer period of time. For each mile of road built, approximately 6.75 acres of soils are disturbed and taken out of production. In addition, 1.5 acres of soil area are disturbed for an average size borrow pit. The average borrow pit supplies rock for approximately 2 miles of road.

The greatest amount of surface disturbance resulting from road construction would occur in Alternative 4. The least would occur in Alternative 6. In decreasing order, Alternatives 6, 5, and 3 rank second, third, and fourth in amount of surface disturbance resulting from road construction.

Miles of Road Construction on High or Very High MMI Soils

Road building activities are the major causes of harvest-related mass movement events and the major contributors of harvest-related sediment. A plan that minimizes road building over these soils would lessen the possibility of mass movement occurrence and associated impacts. Table 4–2 presents miles of road proposed for construction on high and very high Mass Movement Index (MMI) soils, by alternative.

Table 4–2
Total Miles of Road Construction by MMI

	Alternatives					
	1	*2*	*3*	*4*	*5*	*6*
High MMI	0	9.6	11.9	20.0	14.2	15.2
Very High MMI	0	0.5	1.2	5.0	1.2	0.4

Alternative 4 proposes building approximately 5.0 miles of road on very high MMI soils. Alternatives 3 and 5 propose building 1.2 miles on these soils. Alternatives 2 and 6 propose building 0.50 and 0.40 miles of road on very high MMI soils, respectively.

Alternative 4 proposes building 20.0 miles, the most miles of road on high MMI soils. Alternative 2 proposes the least, with only 9.6 miles. Alternatives 6, 5, and 3 range second through fourth, in decreasing order, with 15.2, 14.2 and 11.9 total miles on high MMI soils.

Total Acres Disturbed on High and Very High MMI Soils

The amount of disturbance can be determined by adding the disturbance created from road building to the amount of disturbance created during falling, yarding, and timber harvesting operations. The total acres disturbed on soils with high and very high Mass Movement Index provides a means of assessing the alternatives relative to each other. Although it is not possible to calculate or predict quantities and occurrences of mass movement events, an index of the alternatives can be assessed. A greater amount of disturbance on high and very high MMI soils will probably result in a greater amount of mass movement incidents compared to soils with low or moderate MMI. The total acres disturbed gives an indication of the area which would be subject to sheet and rill erosion. In order of decreasing impacts, Alternative 4 is highest with 322.4 acres, followed by Alternatives 6, 5, 3, and 2 in decreasing order with 238.7, 221.8, 188.1, and 150.8 acres, respectively.

In summary, Alternative 2 will produce the least amount of impacts by maintaining natural rates of erosion and by disturbing less area of land (through road construction and yarding operations) than the other action alternatives.

Table 4-3 presents the Soil Hazard Comparison for proposed road construction and harvest activity for each alternative.

Table 4-3
Soil Hazard Comparison

	Alternatives					
Evaluation Factors	*1*	*2*	*3*	*4*	*5*	*6*
Total Harvest Acres	0	2,191	2,231	3,603	2,581	3,060
Harvest Acres on Soils With:[1]						
Very High MMI	0	24	32	210	33	<1
High MMI	0	814	981	1,326	1,161	1,333
Total	0	838	1,013	1,536	1,194	1,333
Acres With Yarding Suspension Requirements on High and Very High MMI Soils[2]						
High MMI Soils:						
Yarding Partial Suspension	0	814	981	1,236	1,161	1,333
Very High MMI Soils:						
Full Suspension Yarding	0	24	32	210	33	<1
Total Miles of Road Construction Proposed	0	51.1	59.1	78.9	60.7	71.0
Miles of Road Construction on:						
Very High MMI Soils	0	0.5	1.2	5.0	1.2	0.4
High MMI Soils	0	9.6	11.9	20.0	14.2	15.2
Total	0	10.1	13.1	25.0	15.4	15.6
Total Acres of Disturbance on High and Very High MMI Soils	0	150.8	188.1	322.4	221.8	238.7
Total Disturbance from Road Construction and Yarding Operations (Percent)	0	25	26	24	25	25

[1]Many of the high and very high MMI soils on the sale area occur in complexes with low and moderate MMI soils. A complex is an area of two or more dissimilar taxa components or miscellaneous areas occurring in a regularly repeating pattern. The major components of a complex cannot be mapped separately at a scale of 1:24,000. Values for this table were derived using percent composition of the individual soil types in the complexes established during the soils and vegetative survey.

Many of the soil map units are large and although we know what percentage of the map unit has a high or very high MMI, we do not know where these soils are located in that unit. Example: A road passing through a high MMI/low MMI soils complex may cover all high MMI soils, all low MMI soils, or a percentage of both.

[2]Actual acres by suspension requirement may be more than acres listed here due to location and topography of the unit.

Wetlands

There are several forested and non-forested wetland types and/or habitats in the project area (DeMeo and Loggy, Forest Service Paper, Unpublished). These habitats/types have been placed in four major groupings which are defined in Chapter 3. Wetlands are habitat to a variety of wildlife species. Some species use wetlands seasonally or as travel ways. Additionally, wetlands function to moderate flood and low streamflows. Table 4-4 presents data on wetland inventory acres by VCU.

Table 4-4

Wetland Inventory Data by VCU Total for National Forest Land

VCU	Total Acres	Acres Forested Wetlands	Acres Muskeg	Acres Estuary	Percent Wetlands
742	31,805	508	468	0	3
746	14,406	6,187	3,096	3	64
747	16,737	4,318	2,570	0	41
748	19,937	6,103	3,081	0	46
753	9,303	4,392	1,665	0	65
Total	60,383*	21,000	10,412	3	52

*Total acre calculations are for VCUs 746, 747, 748 and 753 only, because VCU 742 comprises less than 1 percent of the project area.

Data for proposed roads and units on wetlands were derived using map overlays (soils with timber and road coverages) in a Geographical Information System (GIS). Wetland types and/or habitats were generated using soil inventory maps on the GIS. This was possible because of correlations between soil series and plant associations (DeMeo and Loggy, Forest Service paper, unpubl.). Data presented in all tables include all mapped areas within the project area. This does not include private or State lands. Estuaries are included in this total. Wetland habitat type maps are available for viewing in the Administrative Record.

Effects of Timber Harvest

The frequency of wetlands on the project area precludes avoidance when implementing timber harvest activities. Approximately 52 percent of the sale area classifies as wetland; 35 percent is forested wetland. Many of the forested wetlands on the sale area do not support commercial or economic stands of timber and are not scheduled for harvest in this or future operating periods. Muskeg areas proposed for harvest are inclusions within the forested areas. Having no commercial timber in muskegs, these areas will not be harvested, but may be affected by yarding operations within the unit. Between 0 and 1,182 acres of forested wetland are scheduled for harvest in this operating period depending on alternative.

Table 4-5

Proposed Harvest Activity on Wetlands by Alternative (Acres)

	Alternative					
Wetland Category	*1*	*2*	*3*	*4*	*5*	*6*
Forested Wetlands[1]	0	318	457	1,182	1,041	857
Muskeg (Inclusions Not Harvested)	0	73	90	111	67	85
Non-Wetlands	0	1,816	1,699	2,346	1,472	2,131
Total Harvest	0	2,207	2,246	3,639	2,580	3,073

[1]Many of the wetlands on the sale area occur in complexes with non-wetlands. A complex is an area of two or more dissimilar soil components or miscellaneous areas occurring in a regularly repeating pattern. The major components of a complex cannot be mapped separately at a scale of 1:24,000. Values for all tables were derived using percent composition of each soil type in the complexes established during the soil and vegetation survey.

Table 4-5 presents data on proposed harvest activity on wetlands by alternative. Alternative 2 harvests the least amount of forested wetlands (318 acres), while Alternative 4 harvests the most acres (1,182 acres). Alternatives 5, 6, and 3 rank second, third, and fourth in terms of most acres of forested wetlands proposed for harvest.

Harvesting wetlands involves manipulation of the vegetation. This temporarily changes the hydrology of the site. Patric (1966) suggests an increase in water yield as a result of timber harvest. A temporary increase in soil moisture is expected until equivalent transpiration and interception surfaces are reestablished.

Typically, the forested wetlands to be harvested are mixed with non-wetland timber. Observation has shown that wetland soils revegetate slowly compared to non-wetlands (in terms of volume). To date, data supporting this observation has not been obtained. Reforestation of wetland sites is expected to be slower than non-wetland sites and merchantable timber may not be available in a 100-year rotation. Area where slow regeneration is expected ranges from 15 to 43 percent of the total harvest, depending on alternative. Table 4-6 compares acres of total harvest for the project area to acres harvested on forested wetlands. This may correspond to a percent of harvest area where slow regeneration is expected. For example, Alternative 6 will harvest 28 percent of its total harvest on forested wetlands.

Table 4-6
Proposed Harvest Activity on Forested Wetlands

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Total Harvest (Acres)	0	2,191	2,231	3,603	2,581	3,060
Forested Wetland Harvest (Acres)	0	318	457	1,182	1,041	857
Percent of Total	0	15	20	33	40	28

Effects of Roads

New construction in wetlands will be limited to roads, landings, and associated drainage structures. The amount and frequency of wetlands in the study area make it very difficult to avoid construction on wetlands. Construction and maintenance of the roads and landings will meet the Best Management Practices described in the State's approved program and the baseline provisions as outlined in 33 CFR 323.4 and discussed in Chapter 2.5.

Table 4-7 presents data on proposed wetland alterations caused by road construction for each alternative. A figure of 6.75 acres per mile of road is used to display acres of wetland altered by roads. This is a disturbed road corridor 56 feet wide. Alternative 2 impacts the fewest wetland acres with road construction (148 acres) and Alternative 4 impacts the most acres (307 acres). Six-tenths of one acre of estuary will be impacted by roads in Alternative 4. Estuaries in all other alternatives will not be impacted by road construction.

Table 4-7
Area of Wetlands Altered by Proposed Road Construction (Acres)

	Alternative					
Wetland Category	*1*	*2*	*3*	*4*	*5*	*6*
Forested Wetlands[1]	0	99	141	245	204	187
Muskeg	0	49	60	62	60	63
Estuary	0	0	0	0.6	0	0
Total Wetlands	0	148	201	307	264	250
Non-Wetlands	0	204	191	236	151	236
Total	0	352	392	543	415	486

[1]Refer to footnote 1 on Table 4-3.

Roads through wetlands can affect the flow and reach of water in the wetland. Placement of culverts and other road drainage features insures that flow and reach of water in the wetland are maintained at natural levels. Impacts from roads are limited to the wetland directly underlying the road prism and associated cuts and fills.

Use and maintenance of Best Management Practices (BMPs) in construction will assure that water flows, circulation patterns, and chemical and biological characteristics of the water within wetlands will not be impaired. Additionally, use of BMPs will assure that adverse effects on the aquatic environment will be minimized. In terms of the terrestrial environment, wildlife use of wetlands for travel ways and predation may be reduced during periods of vehicle traffic on the roads.

Roads Through VCU 742

Each alternative except Alternative 5 has proposed roading inside VCU 742.

The proposed roads in VCU 742 to access timber will have little impact on wetlands or soils having high or very high Mass Movement Index rating. Table 4-8 presents data on the impacts roads will have on unstable soils and wetlands within VCU 742, by alternative.

Table 4-8

Acres of Roads Proposed on Unstable Soils and Wetlands in VCU 742

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
High MMI Soils	0.0	1.7	1.7	0.0	0.0	3.4
Very High MMI Soils	0.0	0.0	0.0	0.0	0.0	0.0
Wetlands	0.0	3.4	3.4	0.0	0.0	0.0
Total Road Planned	0.0	17.6	18.9	2.0	0.0	8.0

The impact roads will have on VCU 742 will be removal of approximately 12 acres of land from production (average value for combined alternatives). This equates to approximately 0.04 percent of the entire VCU.

Long-Term Cumulative Effects

This section addresses the long-term cumulative effects of alternatives on wetlands. The analysis includes past, present, and expected future timber harvest and road construction activities, based on the current Tongass Land Management Plan (TLMP). These projections may or may not occur.

Three time periods are used to display the cumulative effects: (1) 1990; (2) 2000, the end of the Operating Plan; and (3) 2060, the end of the rotation. The following assumptions were used to establish a scenario for discussing cumulative effects:

- The operable timber base will remain the same. All analysis will be based on the operable timber within the VCU.
- Operable timber retained for old-growth characteristics will be maintained. There will be no changes to the amount or the location of retained timber.
- Standards and guidelines for harvest and road construction activities will remain constant over the rotation.
- Future accessibility of timber in relation to wetlands will be similar to the accessibility encountered in this sale.
- Borrow pits are not located on wetland sites.
- Distribution of wetlands is similar in all VCUs. This is not accurate for all VCUs; however, it is a necessary assumption for statistical purposes.

Cumulative Effects of Timber Harvest

Prior to 1990, approximately 1,300 acres of timber were harvested in the project area. It is unknown how many of those acres are forested wetlands. During this operating period, between 628 and 1,182 acres of forested wetlands are scheduled for harvest, depending on alternative.

Cumulative effects on wetlands from timber harvest were calculated using scheduled timber harvest data to the end of the rotation, presented in Table 4-44. To calculate the acres of wetlands expected to be harvested in the future, it was necessary to calculate the percent of wetlands harvested for this 5-year Operating Period, by alternative. This percentage was multiplied by the scheduled harvest acres at the end of the rotation to obtain projected acreage of forested wetlands to be harvested in the future. It was assumed that an equal area will be harvested for each alternative in the future.

Within this 5-year Operating Period an average of 30 percent of the planned harvest will occur in wetlands (average of Alternatives 2 through 6, Table 4-6). Table 4-9 presents data on estimated cumulative effects of scheduled timber harvest on wetlands by alternative. Approximately 12.5 percent of the total wetlands in the project area will be scheduled for harvest at the end of the rotation (average of each alternative).

Table 4-9

Cumulative Effects of Timber Harvest on Wetlands by Alternative

Alternative	Total Wetlands (Acres)	Forested Wetlands Harvested (Acres)			Percent of Total Wetlands At 2060
		1990	*2000*	*2060*	
1	31,415	*	0.0	0.0	0.0
2	31,415	*	318.3	1,849.4	5.9
3	31,415	*	456.9	2,269.8	7.2
4	31,415	*	1,182.3	3,422.1	10.9
5	31,415	*	1,041.4	3,645.6	11.6
6	31,415	*	856.7	3,128.4	10.0

*Unknown area of wetlands harvested prior to 1990.

Research on hydrologic effects of wetlands and loss of wetlands in a given watershed is limited. Studies of the Charles and Neponset River watersheds in Massachusetts are frequently cited to document the influence of wetlands on peak flows (Anderson-Nichols and Co., Inc. 1971; U.S. Army Corps of Engineers 1972; Larson 1981; Zinn and Copeland 1982; Sather and Smith 1984). In the Charles River study, the U.S. Army Corps of Engineers (1972) determined that a loss of 40 percent of the wetlands within the basin would increase flood damage.

Increased water yield is expected after timber harvest. In a study done in the Staney Creek watershed, Bartos (1987 unpublished) found a significant increase in low flows after 25 percent of the watershed had been harvested. A significant increase in average water yield was found after 30 percent of the watershed had been harvested. (See discussion in Long-Term Sale, Chapters 3 and 4.) Approximately 1.4 percent of the wetlands in the watershed had been converted to roads during this harvest. How much of the increase in water yield and low flow is attributable to the 1.4 percent conversion of wetlands to roads is unknown.

Cumulative Effects of Roads

Prior to 1990, no acres of wetland had been altered by road construction. During this 5-year Operating Period, between 0 and 307 acres of wetland will be altered by roads, depending on alternative. Tables 4-10 through 4-15 display estimated cumulative effects of roads on wetlands by VCU.

Cumulative effects for roads were calculated using the Forest Development Tables found in Chapter 2. Prior to 1990, no roads traversed wetlands, probably because few miles of road were developed. To calculate the acres of wetlands expected to be altered by road construction in the future, it was necessary to calculate the percent of roads traversing wetlands for this 5-year Operating Period. It is assumed the average percent of wetlands altered by road construction at the end of the rotation will be no greater than the average percent altered within this 5-year Operating Period.

Within this operating period, an average of 53 percent of the roads traverse wetlands (for each alternative). Multiplying this percentage (0.53) by 6.75 (acres per mile of road disturbed by cut, fill and road surface) gives us a factor which can be multiplied by the miles of road planned at 2060 (planned plus existing roads from Forest Development Road Tables). The product is wetland acres altered at 2060.

Table 4–10

Cumulative Effects of Road Construction on Wetlands: Alternative 1

VCU	Total Wetlands	Wetland Acres Altered *1990*	*2000*	*2060*	Percent of Total Wetlands At 2060
742	976	0	0	0	0
746	9,286	0	0	0	0
747	6,888	0	0	0	0
748	9,184	0	0	0	0
753	6,057	0	0	0	0
Total	31,415*	0	0	0	

*Total acre calculations are for VCUs 746, 747, 748 and 753 *only,* because VCU 742 comprises less than 1 percent of the project area.

Table 4–11

Cumulative Effects of Road Construction on Wetlands: Alternative 2

VCU	Total Wetlands	Wetland Acres Altered *1990*	*2000*	*2060*	Percent of Total Wetlands At 2060
742	976	0	0.9	15.1	1.5
746	9,286	0	59.4	303.8	3.3
747	6,888	0	86.4	332.7	4.8
748	9,184	0	1.4	292.0	3.2
753	6,057	0	0.0	168.6	2.8
Total	31,415*	0	148.1	1,112.2	

*Total acre calculations are for VCUs 746, 747, 748 and 753 *only,* because VCU 742 comprises less than 1 percent of the project area.

Table 4-12
Cumulative Effects of Road Construction on Wetlands: Alternative 3

VCU	Total Wetlands	Wetland Acres Altered 1990	2000	2060	Percent of Total Wetlands At 2060
742	976	0	0.9	15.2	1.6
746	9,286	0	88.4	306.6	3.3
747	6,888	0	108.7	321.7	4.7
748	9,184	0	2.6	293.3	3.2
753	6,057	0	0.0	168.8	2.8
Total	31,415*	0	200.6	1,105.6	

*Total acre calculations are for VCUs 746, 747, 748 and 753 *only*, because VCU 742 comprises less than 1 percent of the project area.

Table 4-13
Cumulative Effects of Road Construction on Wetlands: Alternative 4

VCU	Total Wetlands	Wetland Acres Altered 1990	2000	2060	Percent of Total Wetlands At 2060
742	976	0	0.0	15.8	1.6
746	9,286	0	159.3	311.6	3.4
747	6,888	0	76.3	324.0	4.7
748	9,184	0	0.0	289.4	3.2
753	6,057	0	72.2	168.8	2.8
Total	31,415*	0	307.2	1,109.6	

*Total acre calculations are for VCUs 746, 747, 748 and 753 *only*, because VCU 742 comprises less than 1 percent of the project area.

Table 4-14
Cumulative Effects of Road Construction on Wetlands: Alternative 5

VCU	Total Wetlands	Wetland Acres Altered 1990	2000	2060	Percent of Total Wetlands At 2060
742	976	0	0.0	15.3	1.6
746	9,286	0	117.3	298.0	3.2
747	6,888	0	67.5	311.0	4.5
748	9,184	0	0.0	289.4	3.2
753	6,057	0	79.7	170.8	2.8
Total	31,415*	0	264.5	1,084.5	

*Total acre calculations are for VCUs 746, 747, 748 and 753 *only*, because VCU 742 comprises less than 1 percent of the project area.

Table 4-15
Cumulative Effects of Road Construction on Wetlands: Alternative 6

VCU	Total Wetlands	Wetland Acres Altered 1990	2000	2060	Percent of Total Wetlands At 2060
742	976	0	0.9	15.2	1.6
746	9,286	0	92.5	306.6	3.3
747	6,888	0	105.3	321.4	4.7
748	9,184	0	2.7	291.9	3.2
753	6,057	0	49.3	167.8	2.8
Total	31,415*	0	250.7	1,102.9	

*Total acre calculations are for VCUs 746, 747, 748 and 753 *only*, because VCU 742 comprises less than 1 percent of the project area.

Most VCU boundaries follow watershed boundaries. One VCU (747) will have 4 percent or more of its wetlands altered by roads by the year 2060 (see Tables 4-10 through 4-15). The reason the VCUs show a higher percentage of wetlands altered at 2060 is due in part to the method of calculation of cumulative effects. It is known that the project area is 52 percent wetlands. Approximately 53 percent of the roads will traverse wetlands in this 5-year Operating Period. This percentage was multiplied by the total roads planned for the VCU (Road Development Tables found in Chapter 2).

An assumption was made that the wetlands are evenly distributed between VCUs. For some VCUs this is not accurate; however, the assumption was necessary because many VCUs do not have enough historical data, i.e. roads, to provide a database by VCU. Assuming that 53 percent of the roads will run through wetlands, even though only 41 percent of a VCU is wetland (VCU 747, Table 4-7), caused predicted numbers, especially percentages, for that VCU to be high: VCU 747 shows an average of 4.7 percent of its wetlands traversed by roads by the year 2060. Using this method, VCUs with less than 52 percent of their area in wetlands will yield a higher percentage of wetlands altered at 2060. Two VCUs listed above have less than 52 percent of their area in wetlands: VCU 747 has 41 percent and VCU 748 has 46 percent of its area in wetlands.

Based on the average and the range of values listed in Tables 4-10 through 4-15, it is estimated that less than 4 percent of the wetlands in any VCU will be altered by road construction at rotation. Roads on private or State land are an unpredictable variable for the VCUs having these lands. Most VCUs will have 3.5 percent or less of the wetlands altered by road construction at rotation. Based on soils and habitat type distribution and extent encountered during the soil and vegetation survey, no wetland habitat type will be lost through implementation of the alternatives. Increases in water yield and peak low flows are expected, though this is probably more a function of timber harvest (loss of interception and evapotranspiration surfaces, trees) on all sites rather than conversion of wetlands to road surfaces.

At the year 2060 (end of rotation) less than 4 percent of the wetlands on the project area will be altered by roads based on an average of all alternatives (See Table 4-16).

Table 4-16 summarizes cumulative effects of wetlands altered by roads from past activity to the end of the rotation (average for each alternative).

Table 4-16
Summary of Cumulative Effects of Wetlands Altered by Road Construction

	1990	2000	2060
Acres of Wetland Altered by Roads	0	235	1,094
Percent of Total Wetland	0	0.8	3.5

Floodplains

The high density of streams in the project area precludes avoiding all floodplains during timber harvest related activities. Environmental consequences in floodplains are generally limited to road construction.

During road construction, both direct or indirect impacts to floodplains can occur. There may be no detectable influence or there can be flow alteration in minor streams due to routing by roadside ditches and culverts. Channel and flow alteration can locally affect the velocity of flows, width and depth of water, and the location of flow. Such factors can physically result in different erosion and sediment transport characteristics.

Best Management Practices (see Standards and Guidelines, Chapter 2) are used to minimize impacts on floodplains as well as to protect roads and drainage structures. Examples of these are:

- Design of bridges and culverts to handle the expected flows.
- Installation of frequent cross drains or ditch relief culverts to minimize erosion from large concentrations of water moving overland or where it enters natural drainages.

Logging activities are controlled to minimize damage to stream banks and bottoms from yarding. Large wood in streams that contributes to stream stability and moderation of flow energy and velocity is generally left in place. In cases where large wood upstream of bridges or culverts could move and block flow, it may be removed to ensure the passage of high flows without causing diversions and erosion.

There would be no human occupancy of floodplains as a result of any proposed alternative. The proposed action would have no floodplain development other than stream crossings. There would not be any loss to property values from the proposed actions nor would human health, safety, and welfare be adversely affected.

Due to the limited changes expected in floodplains, the naturally high amounts of precipitation and runoff conditions, the risk characteristics related to flooding would not change to a significant degree. Road location, construction measures, and drainage structures will have minimal impact on the natural and beneficial uses of floodplains.

Hydrology

Basin Hydrology

The hydrological complex varies from drainage to drainage because of basin geometry and geomorphology, but over the general area there is uniformity.

Most watersheds are dynamic and in a state of quasi-equilibrium where changes occur naturally due principally to anomalies in climatic patterns. When activities occur within southeast Alaska watersheds (such as timber harvest), significant changes in streamflow and sediment delivery are difficult to measure because of the overriding influence of climatic patterns and basin resilience.

Compared to watersheds in other areas of the Unites States, return to previous flow and yield after logging is very rapid if an excessive percentage of the harvest area to total drainage area is not harvested at one time.

Based on available published background data for southeast Alaska, the level of harvest for this period is well within the tolerances of watershed quasi-balance.

The primary source of sediment to streams influenced by development is from roads and landslides. When drainage structures are properly designed and maintained, the effects of sediment become insignificant.

Changes in water temperature and sediment delivery, while best management practices are followed, will be within allowable State Water Quality Standards.

Staney Creek Water Yield

Please refer to the FEIS of the KPC Long-Term Sale for discussion of the Staney Creek Water Yield, section 4.1.4.2.

Water quality can be quantified by temperature and sediment.

Temperature

Removal of streamside trees can raise stream temperature especially on temperature sensitive streams. Temperature sensitive streams were identified in the Tongass Land Management Plan (1979). Negelius Creek (Watershed ID #0102-D79A) is the only temperature sensitive watershed in the project area. Refer to the Fisheries discussion in Chapter 4 of this document for information on units within this watershed which may affect temperature sensitive streams and their associated mitigation measures.

Sediment

Sediment inputs as a result of timber harvest can be separated into three categories; (1) mass wasting, (2) road surface sediments, and (3) sediment from soil disturbance in harvest units.

Mass wasting is discussed in the soils section.

Roads with high sediment yield potential are high gradient roads (greater than 10 percent), near or crossing streams. To preserve water quality, high crowning of the road and timing will be used to reduce sediment inputs and meet best management practices (FSH 2509.22) and State Water Quality Standards.

Soil disturbance within V-notches will cause sediment inputs to streams. Directional felling and split yarding will be used to protect water quality where V-notches occur within the unit. Unit cards will document site specific mitigation measures for the preferred alternative to ensure water quality standards are maintained.

Summary

Entries into most watersheds will be light. Mitigation will be critical to maintaining water quality in watersheds 0102–D79A (Negelius Creek), 0102–D81C (Salt Creek) and 0120–B80C (Upper Salt Creek).

Mass wasting will be monitored to determine if mitigation is effective at preventing management induced soil mass movement.

Visual

The analysis of the visual impacts of the proposed alternatives focuses on the eight viewsheds described in Chapter 3. The presently recognized viewsheds are discussed first (those presently rated as Sensitivity Level I or II by the Area's Visual Resource Inventory). The analysis then addresses the potentially important viewsheds that could evolve from the future roading of this project area, and the subsequent link of this road to Ketchikan.

4 Environmental Consequences

Alternative 1 (No Action)

This alternative retains the environment as described in Chapter 3 of this document.

Alternative 2

Presently Recognized Viewsheds

Carroll Inlet

In this alternative there are only two units within a half-mile of the Carroll Inlet shoreline. Another two units on the slopes above South Saddle Lake about two miles back from the shore will be clearly visible. The combination of the old harvest immediately along the shore, and the proposed units will result in an overall modification visual condition. See Figure 4-13 in the Maps document for Alternative 6 scheme that is similar to the Alternative 2 proposal. There is no harvest proposed north or south of the Shelter Cove area along Carroll Inlet.

Salt Lagoon

The existing impacts from previous harvest on the west side of the lagoon are increased slightly by five units that are scattered above the older harvest. This will result in perpetuating an overall visual condition of modification in the foreground and middleground. The presently unharvested northeast slopes of the lagoon are significantly impacted by 5 units—many on steep slopes directly or obliquely facing the lagoon. This level of harvest plus the existing harvest at the southeast corner of the lagoon decreases the visual quality condition to close to maximum modification. See Figure 4-1 in the Maps document.

Leask Cove

Two highly visible units on the upper slopes above Leask Cove will add to the impact created by the Swan Lake transmission line. Though the units sit on the ridgetop and could potentially blend into the landform, some of the State/Forest boundaries make up the unit boundaries and create some unnatural edges on this forested slope. The combination of these impacts results in maintaining maximum modification visual condition. No plots are available for this area.

Naha Area

Units 23 and 24 are on the very steep slopes running southeast from the south end of Patching Lake will be clearly visible from the southern end of Heckman Lake. This will result in a maximum modification visual condition as seen form this lake. Unit 21 about two miles south of Patching Lake may be just barely visible from the southern end of this lake, therefore creating a partial retention visual condition. (No plots available of this area.)

Potential Viewsheds

Salt Lake and Salt Creek

Four prominent units on steep slopes at the head of the Salt Lake valley will create significant impacts that will result in maximum modification visual condition. A large unit directly above the narrow mouth of the lake will create a similar level of impact. No harvest is proposed on the slopes along the sides of the lake. One unit and portions of two others lie adjacent to about 50 percent of Salt Creek. They are partially screened by a 100–200 foot fisheries buffer. However, a partial retention to modification visual condition results depending on the density of the screen and the viewer position along the stream. No plots are available in these areas.

Main Road Corridor

Well over half the road corridor around Salt Lagoon to the Saddle Lakes area will have harvest units adjacent to it. In a couple of cases the main arterial will be passing through one-half mile to almost one mile of harvested ground. This extensive amount of old-growth timber harvested from the immediate foreground of the road corridor will result in a maximum modification visual condition (see Figure 4-2 in the Maps document). No harvest is proposed along the road through the North Saddle Lakes area except for the south end of the smaller eastern lake. The road as presently located affords several scenic views of these two lakes.

North Saddle Lakes
Two large units on the steep southern slopes of the large lake will result in close to a maximum modification visual condition as seen from the southern end of the lake (see Figure 4–3 in the Maps document). From the northern end of the lake the resulting condition will be closer to modification (see Figure 4–4 in the Maps document). A highly visible unit at the south end of the smaller of the two lakes and the road, as presently located around the southern end of the lake, will result in a modification to maximum modification visual condition depending on how the road blasting is controlled and the unit is designed. The road traverses very steep slopes for about 200 yards just above the shore of the lake and an adjacent meadow. The full bench road cuts and possibly strewn rock and broken trees will be clearly visible from the lake. There is no proposed harvest on the northern shores of these lakes.

Leask Lake
Three units on the very steep slopes about 2 miles east of Leask Lake just outside the State selection boundary will result in close to a maximum modification visual condition (no plots are available in this area.)

Visual Impacts of Timber Harvest in Selected Viewsheds by 2060

It is estimated that by 2060, visual impacts around Salt Lake will remain the same or slightly decrease from those impacts incurred at the end of this planning period. Large remaining areas of visible slopes from this lake would be scheduled for harvest, though harvest proposed in this EIS for this planning period within this viewshed probably exceeds to a slight extent that which would be scheduled for the subsequent periods. Visual impacts in the Leask Lake, Leask Cove, Salt Lagoon, main road corridor and Heckman Lake viewsheds will decrease through 2060 as the extensive harvest proposed in this planning period regenerates and a somewhat smaller scale of harvest is scheduled in subsequent periods. In the North Saddle Lakes viewshed visual imapcts will recover significantly as proposed harvest in this period regenerates over the next several decades and very little additional harvest is planned due to the old-growth prescription given to most of the rest of the viewshed from this lake. Along much of Carroll Inlet visual impacts by 2060 will significantly increase to at least a modification visual condition due to the fact that much of the remaining timber volume after this period is in the lands along the east side of Carroll Inlet.

Alternative 3

Presently Recognized Viewsheds

Carroll Inlet
A group of five units dispersed throughout the diverse middleground terrain just north and south of Shelter Cove will result in a continuation of a modification visual condition caused by the existing harvest around the cove. A group of five units on the previously unaltered foreground and middleground landscapes south of Shelter Cove will result also in a modification visual condition. (No plots are available for this area.)

Salt Lagoon
Units on the west side of the lagoon along with the old harvest units will result in a modification visual condition. Units on the northeast slopes of the lagoon will result in a partial retention to modification condition. The scale and location of Unit No. 39 makes it a visually dominating unit from certain viewing positions, and therefore makes it difficult to attain a strictly partial retention visual condition (see Figure 4–5 in the Maps document).

Leask Cove
This alternative proposes one unit (No. 49) on the steep slopes above Leask Cove and the transmission line. The resulting visual condition remains close to maximum modification, though the visual impacts are slightly less than with Alternative 2. The unit by itself would result in a modification condition.

Naha Area
This alternative proposes no units on the slopes that are visible from portions of Patching and Heckman Lake.

Potential Viewsheds

Salt Lake and Salt Creek
The proposed harvest at the head of this lake is somewhat less in scale than Alternative 2. However, two large units lay on very steep slopes and clearly dominate the natural landscape character, resulting in a maximum modification visual condition. However, there is no proposed harvest on the foreground slopes adjacent to the lake. With the exception of a corner of Unit No. 42, no harvest is proposed near the stream corridor, therefore for the most part resulting in a retention visual condition. (No plots are available for this area.)

Main Road Corridor
About 1.25 miles of the main road corridor around Salt Lagoon passes adjacent to harvest units. Most of this mileage is through one unit, No. 41. The rest of the road is aligned away from other units or passes through some of them for no more than several hundred feet. In other words over 80 percent of this section of road will pass through standing old-growth timber (see Figure 4-6 in the Maps document). Overall this results in a partial retention visual condition for this corridor segment. The road corridor through the North Saddle Lakes area is not impacted by any harvest in the foreground viewshed except where it passes through a unit at the south end of the smaller of the two lakes. The road as presently located affords several scenic views of North Saddle Lakes.

North Saddle Lakes
Three units on the southern slopes of the larger lake will result in close to a partial retention visual condition from most viewpoints on the lake (see Figure 4-7 in the Maps document). At the southern end the impacts are closer to modification (see Figure 4-8 in the Maps document). A highly visible unit at the south end of the smaller of the two lakes and the road, as presently located around the southern end of the lake, will result in a modification to maximum modification visual condition depending on how the road blasting is controlled and the unit is designed. The road traverses very steep slopes for about 200 yards just above the shore of the lake and an adjacent meadow. The full bench road cuts and possibly strewn rock and broken trees will be clearly visible from the lake. There is no proposed harvest on the northern shores of these lakes.

Leask Lake
This alternative proposes a similar scale of harvest on the steep slopes 2 miles east of Leask Lake, therefore resulting in close to a maximum modification visual condition. (No plots available for this area.)

Visual Impacts of Timber Harvest in Selected Viewsheds by 2060
Visual impacts in the Salt Lake viewshed by 2060 will remain about the same as that described for this planning period. Visual impacts in the Leask Lake, Leask Cove, main road corridor, and Salt Lagoon viewsheds will decrease somewhat from that desribed for this planning period. This is due to the fact that much of the volume within these viewsheds is proposed for harvest in this period, and that much of the remaining acres in some of these viewsheds are in old-growth prescription. Visual impacts in the North Saddle Lakes viewshed will significantly decrease—particularly around the larger of the two lakes—as the relatively small first entry displayed in this plan regenerates, and the old-growth prescription in the area significantly reduces the size of subsequent entries. As with Alternative 2, visual impacts along Carroll Inlet will significantly increase by 2060 as more extensive harvest is proposed in subsequent periods in this area.

Alternative 4

Presently Recognized Viewsheds

Carroll Inlet
This alternative will create heavy visual impacts along many sections of Carroll Inlet—along the Swan Lake transmission line north of Shelter Cove, around Shelter Cove (see Figure 4–9 in the Maps document), and south to Osten Island. The impacts will be the greatest on the steep slopes along the transmission line and the steep slopes from Shelter Cove to Island Pt. (see Figure 4–10 in the Maps document) where a maximum modification visual condition will result.

Salt Lagoon
Major visual impacts are created around the northwest and northeast shores of Salt Lagoon by units that are similar in location to those in Alternative 2, but much larger (see Figure 4–11 in the Maps document). These units in combination with the older harvest will result in a maximum modification visual condition.

Leask Cove
No harvest is proposed in this alternative on the ridge above this cove. Hence the visual condition will remain as it is presently.

Naha Area
No harvest is proposed on the slopes that face part of Heckman and Patching Lakes. Therefore this alternative will create no visual impacts to this area.

Potential Viewsheds

Salt Lake and Salt Creek
Large units on all the steep slopes around this lake, except the southeastern side, will result in a maximum modification visual condition.

Main Road Corridor
Over 75 percent of the road corridor around Salt Lagoon will pass through harvested areas that are similar in location to Alternative 2, but much larger (see Figure 4–2 in the Maps document for Alternative 2). The result is a maximum modification visual condition along the foreground of this road corridor. There is no harvest proposed along the immediate road corridor around North Saddle Lakes except for a large unit at the south end of the smaller lake. The road as presently located affords several scenic views of these two lakes.

North Saddle Lakes
Two units similar to those in Alternative 2 (see Figures 4–3 and 4–4 in the Maps document) plus an additional large unit at the southwest corner of the lake will create significant visual impacts that will result in a maximum modification visual condition around the southern slopes of the lake. A highly visible unit at the south end of the smaller of the two lakes and the road, as presently located around the southern end of the lake, will result in a modification to maximum modification visual condition depending on how the road blasting is controlled and the unit is designed. The road traverses very steep slopes for about 200 yards just above the shore of the lake and an adjacent meadow. The full bench road cuts and possibly strewn rock and broken trees will be clearly visible from the lake. There is no proposed harvest on the northern shores of these lakes.

Leask Lake
No harvest is proposed on the slopes facing this lake. This viewshed will thus remain in a natural unaltered condition.

Visual Impacts of Timber Harvest in Selected Viewsheds by 2060

Visual impacts in the Salt Lake and North Saddle Lake viewsheds are estimated to remain about the same in 2060 as those described in this plan for this first period. Significant acreage within these viewsheds remains after this first period, and very little of it is designated old-growth prescription. Visual impacts along the main road corridor, around

Salt Lagoon, and along Carroll Inlet will decrease compared to the impacts created from this first entry. This is because this first entry harvests such a large proportion of these viewsheds, as as regeneration occurs over the next several decades, much smaller entries will be made in these subsequent periods.

Alternative 5

Presently Recognized Viewsheds

Carroll Inlet
In this area this alternative includes primarily the same units as Alternative 6, thus creating a modification to maximum modification visual condition along the middleground slopes on the west side of this inlet. See Figure 4-13 in the Maps document for area around Shelter Cove where the resulting condition is modification, and Figure 4-14 in the Maps document of the slopes south of Shelter Cove where the impacts are closer to maximum modification.

Salt Lagoon
Unit 23 is the only highly visible harvest unit immediately around the lagoon—this alternative results in a visual condition slightly lower than partial retention, even though older harvested areas are beginning to establish enough of a textural quality to decrease the dominance they once had on the natural landscape character (see Figure 4-12 in the Maps document). Units 26, 29 and 33 will be partially visible a couple of miles to the southeast of the lagoon and may result in a partial retention condition. (No plots available of this area.)

Leask Cove
No harvest is proposed around Leask Cove or other areas near the head of George Inlet in this alternative. The major visual impacts in this area remain the old harvest and the transmission line corridor which now create almost a maximum modification visual condition.

Naha Area
No harvest is proposed on the steep slopes facing Patching and Heckman Lakes. Therefore the natural condition will be maintained in the landscapes seen from these lakes.

Potential Viewsheds

Salt Lake and Salt Creek
Unit 21 at the head of Salt Lake will result in a visual condition slightly lower than modification. No other harvest is proposed in this viewshed.

Main Road Corridor
This alternative does not specifically identify a main road corridor that would ultimately connect the Carroll Inlet area to the Ketchikan road system other than the section around the North Saddle Lakes area. This alternative proposes no harvest immediately along this section of road. The road as presently located affords several scenic views of these lakes.

North Saddle Lakes
This alternative proposes no units that will be visible from either of the North Saddle Lakes except for small corners of Unit No. 16 which drop down from the ridge above the northeast shore of the smaller lake. This will result in a partial retention visual condition from the southern end of this smaller lake. The rest of North Saddle Lakes viewshed remains in an unaltered condition except for the road corridor around the lakes. The road, as presently located around the southern end of the lake, will result in a modification to maximum modification visual condition depending on how the road blasting is controlled. The road traverses very steep slopes for about 200 yards just above the shore of the lake and an adjacent meadow. The full bench road cuts and possibly strewn rock and broken trees will be clearly visible from the lake. There is no proposed harvest on the northern shores of these lakes.

Leask Lake
This alternative proposes no units that would impact the viewsheds of this lake.

Visual Impacts of Timber Harvest in Selected Viewsheds by 2060

Though significant areas of old-growth prescription within the Salt Lake and Salt Lagoon viewsheds would remain unharvested by 2060, there are still large areas of these viewsheds that would be subject to harvest in subsequent entries after the present planning period. This would result in visual impacts in 2060 similar to those described for the present planning period. Large old-growth prescription blocks in the Leask Cove, Leask Lake, and North Saddle Lakes areas result in virtually no visual impacts in this planning period. Assuming these old-growth areas remain unharvested, there will be very little visual impacts to these viewsheds by 2060. The only impact in the Leask Cove area would be from the Swan Lake transmission corridor and possible development on private or State lands. Visual impacts along Carroll Inlet by 2060 are estimated to be about the same as those described for this present planning period. This is due to the significant amount of acres remaining to be scheduled for future harvest in this viewshed.

Alternative 6

Presently Recognized Viewsheds

Carroll Inlet

From Shelter Cove south to Hume Island there is a long string of units proposed just back from the shoreline, primarily on middleground slopes. Many are on highly visible steep slopes directly facing the waterway. The resulting visual condition is from modification in the immediate area around Shelter Cove (see Figure 4–1 in the Maps document), and close to maximum modification on some of the steeper more uniform slopes south of Shelter Cove (see Figure 4–13 in the Maps document).

Salt Lagoon

Units to the northwest of the lagoon in combination with the old harvest will result in a maintenance of the modification visual condition. Units to the northeast of the lagoon will be slightly more prominent, and in combination with the old harvest will result in a visual condition slightly lower than modification (see Figure 4–15 in the Maps document).

Leask Cove

One unit, No. 58, will be highly visible on the steep slopes above this cove and will result in maintaining a maximum modification visual condition created by the older harvest and particularly the transmission line corridor that cuts across the slope just below this unit. (No plots available of this area.)

Naha Area

The upper portion of unit 45 (possibly a portion of No. 44) will be partially visible from the middle of Heckman Lake looking directly to the head of the lake through a break in the foreground slopes (see Figure 4–16 in the Maps document). However, the level of this impact would still result in a partial retention visual condition and hence meet the inventoried objectives for areas actually outside a LUD II area, but seen from use areas within the LUD II.

Potential Viewsheds

Salt Lake and Salt Creek

No units are proposed on the steep slopes immediately around the lake. However, four units on steep middleground slopes around the valley at the head of the lake will be highly visible and result in a maximum modification visual condition. (No plots available for this area.)

Main Road Corridor

This alternative results in moderate impacts to the Salt Lagoon portion of the road. A little over 20 percent of this corridor passes through harvested ground. In most cases these stretches are from several hundred to a thousand feet long (see Figure 4–18 in the Maps document). Overall, this results in a modification visual condition. On the west side of the

lagoon this corridor passes through the approximately 25-year-old second growth. Selective thinning and/or small patch cuts (up to about one-half acre) could open up views of the lagoon from the road. There is virtually no impact within the immediate foreground of the North Saddle Lakes portion of the road corridor. This section of road as presently located affords several scenic views of these lakes.

North Saddle Lakes
Harvest around the large lake in this alternative is also concentrated on the southern slopes where two units will be clearly evident. Their design, location and separation will result in a modification visual condition (see Figures 4-18 and 4-19 in the Maps document). The smaller lake to the east will be impacted by only one unit sitting primarily on a ridge top above the northeast shore of the lake. This will result in a partial retention visual condition. The road, as presently located around the southern end of the lake, will result in a modification to maximum modification visual condition depending on how the road blasting is controlled. The road traverses very steep slopes for about 200 yards just above the shore of the lake and an adjacent meadow. The full bench road cuts and possibly strewn rock and broken trees will be clearly visible from the lake. There is no proposed harvest on the northern shores of these lakes.

Leask Lake
Units 58 and 59 are on the steep slopes facing Leask Lake. With the straight boundaries conforming to the National Forest—State land boundaries, this harvest will result in close to a maximum modification visual condition.

Visual Impacts of Timber Harvest in Selected Viewsheds by 2060
In the Salt Lake, Salt Lagoon, Leask Cove and Lake, and the main road corridor viewsheds visual impacts by 2060 are estimated to be somewhat less than that described for this present planning period. This is due to the regeneration of the extensive harvest planned in this period and the expected somewhat smaller entries in subsequent decades. In the North Saddle Lakes viewshed visual impacts will decrease by 2060 as the proposed first period harvest regenerates, and future entries are greatly limited by the old-growth prescription block in this viewshed. In the Carroll Inlet viewsheds visual impacts by 2060 are estimated to remain the same as those described in this document for this planning period.

Recreation

The effects of the alternatives on recreation are displayed by: (1) a summary table showing, by alternative, the relative change in acres in each Recreation Opportunity Spectrum (ROS) class; and (2) changes to recreation opportunities in key recreation areas. This second section includes a summary of the major ROS class changes in key recreation areas and a description of more site-specific recreation opportunities and impacts that could result from harvest and road development.

ROS Class Acres

The Recreation Opportunity Spectrum provides a framework for classifying recreation opportunities available in a geographic area. These opportunities range from primitive opportunities, where isolation, risk, and self reliance are the highest, to urban, where group activities and competitive sports are prevalent with no opportunity for isolation, risk, or self reliance. Changes in ROS classes that would result from the alternatives provide an indication of the effects of the alternatives on the recreational setting, as well as on recreation opportunities. The effect of each alternative on recreation sites was evaluated by analyzing the roads and harvest units proposed under each alternative and their relationship to sites with recreation potential.

The ROS class of an area can be affected by three major factors including: (1) the level of recreation facility development and management, (2) the number of recreating parties encountered in an area, and (3) the increase in access and human development in an area resulting from roading and logging.

The alternatives displayed in this document propose roading and timber harvest plans which result in varying changes in the existing ROS classes on the project area. In general, the alternatives would result in a shift from Primitive 1, Primitive 2, and Semi-Primitive Non-Motorized to Roaded Modified and Roaded Natural. Table 4–17 displays the resulting ROS classes under each alternative for the entire project area. Alternative 1, which is the No Action Alternative, lists the existing acres.

Table 4–17
ROS Class Acres

	Alternative					
ROS Classes	*1*	*2*	*3*	*4*	*5*	*6*
Primitive 1	4,662	1,968	2,358	2,344	3,763	2,146
Primitive 2	696	55	105	105	696	105
Semi-Primitive Non-Motorized	36,217	31,575	28,992	26,066	25,365	25,924
Semi-Primitive Motorized	2,200	2,200	2,200	2,200	2,200	2,200
Roaded Natural	1,626	2,542	2,132	3,514	2,364	2,618
Roaded Modified	14,977	22,038	24,591	26,149	25,990	27,385
Rural	0	0	0	0	0	0
Urban	0	0	0	0	0	0

Each alternative provides for a shift away from primitive recreation settings towards more roaded, motorized recreation opportunities. Road construction associated with timber harvest often creates numerous recreation opportunities and benefits. Currently, the project area is accessible by boat or air travel. Roads developed in the project area would remain isolated and would not be accessible for the great majority of roaded recreation opportunities. Limited benefits associated with hunting and hiking could occur. These opportunities could include the use of the road system by portable recreation vehicles, such as motorcycles and all terrain vehicles, on roads left open for this activity. Figure 3–7 in the Maps document indicates the location of the following areas.

Key Recreation Area Changes
Each of the following key recreation area summaries describes the recreation opportunities that exist should a tie road connect Ketchikan with the project area. Alternative 3 emphasizes recreation and visual management while Alternative 1 is the No Action Alternative and consequently is not mentioned in the following summaries.

Heckman and Patching Lakes
The Naha River Area, which includes Heckman and Patching Lakes, is adjacent to the project area and currently classified as Primitive 2. For this area to retain its Primitive 2 classification it must be 2 to 3 miles from any road or trails with motorized use, depending on the surrounding terrain. All the alternatives, except Alternative 5, propose roads within the limit which would result in a change to Semi-Primitive Non-Motorized for some of the Heckman and Patching Lakes area.

There is potential for development of a trailhead and trail off the proposed road system from the upper Salt Creek area that could access the Naha River area and associated cabin system. This potential does not exist for Alternative 5 since the proposed road system for this alternative is limited.

Two of the harvest units proposed in Alternative 2 will be clearly visible and two of the units in Alternative 6 may be partially visible from Heckman Lake, where two recreation cabins are located. Viewing a harvest unit from a remote cabin may alter some individual's recreation experience simply because it does not fit the primitive experience that many cabin users are seeking.

Salt Lagoon

The Salt Lagoon area is classified as Roaded Modified and would retain that classification for each alternative. The area is surrounded by steep mountain scenery and old-growth spruce flats. Three streams flow into Salt Lagoon providing the opportunity for both fresh and saltwater sport fishing along with crabbing and shrimping. Each alternative offers the potential for an access trail across State land from the proposed road system to the Lagoon. The opportunity for dispersed camping on State land also exists.

Each alternative proposes harvest units that will be at least partially visible from Salt Lagoon. As previously explained, some individuals may feel that viewing harvest units while recreating may have a negative effect on their recreation experience.

North Saddle Lakes

Most of the North Saddle Lakes area will change from a classification of Semi-Primitive Non-Motorized to Roaded Modified for each alternative. The exception to this is a quarter-mile strip along the north shore of the large North Saddle Lake which will be classified as Roaded Natural. Both North Saddle Lakes have potential for day use areas, campgrounds, or dispersed camp sites. The opportunity also exists for developing loop trails around one or both lakes. Sport fishing could be developed and a small boat ramp on the large North Saddle Lake would make it more accessible for canoes, skiffs, and small motor boats.

All alternatives propose harvest units that will be visible from both lakes. The least amount of visual impact could be expected with Alternative 5 where small corners of one unit will be visible from the small North Saddle Lake. The developed recreation potential of this area will be impacted.

South Saddle Lakes

The large South Saddle Lake area is currently classified as Semi-Primitive Non-Motorized changing to Roaded Modified for all alternatives. The small South Saddle Lake area will retain its classification of Roaded Modified. The clearing for the Swan Lake power line runs along one side of the small South Saddle Lake making it less desirable for recreation development. Both lakes currently support some sport fishing with the opportunity for further development. All alternatives have potential for developing a trailhead and trail into Large South Saddle Lake from the proposed road system. A recreation cabin, three-sided shelter, or dispersed camp sites could be developed on the larger lake.

Each alternative proposes some units that may be visible from the large South Saddle Lake.

Salt Lake above Salt Lagoon and Salt Creek

This area is currently classified as Semi-Primitive Non-Motorized and would change to Roaded Modified for all alternatives except 5. Alternative 6 provides the opportunity to develop a barrier free recreation cabin on Salt Lake that would be easily accessible to the disabled. The road proposed for this alternative is close enough to provide access within a mile of a cabin. Other opportunities include a trailhead and trail around Salt Lake that eventually connects with the Naha trail system and/or a trail to Small Lake where there is potential for a three-sided shelter. An access trail for fishing could be developed from the road system to Salt Creek.

Alternatives 2 and 4 propose harvest units that border the shore of Salt Lake which may make this area less desirable for recreation development. A small boat ramp could be included for these alternatives since proposed roads come close to the lake shore. Alternatives 3 and 6 also propose harvest units that will be visible from Salt Lake. There are no visual effects from Alternative 5, consequently the area would retain its Semi-Primitive Non-Motorized classification and associated recreation opportunities.

Shelter Cove

This area will retain its current classification of Roaded Modified. Shelter Cove provides good anchorage and has potential for a boat ramp and dock. A boat ramp would make upper Carroll Inlet more accessible to people with small boats that currently cannot access this area. Increased use of upper Carroll Inlet could occur creating more of an impact in this area. Those people with larger boats that currently have access to upper Carroll Inlet may be concerned that their primitive boating opportunities will be lost. Shelter Cove also has potential for the development of dispersed camp sites and/or a day use area accessible from the beach.

Transportation

This section discusses the effects of the alternatives upon the development and management of the Forest road system. The effects of the transportation system on other resources are considered in the sections relating to the environment (i.e., soil, water, visuals, fisheries, etc.). The effects of each alternative on the transportation system will be grouped into the following categories: (1) Construction and Costs, (2) Road Development, (3) Access Management, (4) Share-cost Opportunities, and (5) Log Transfer Facilities.

Road development patterns are often similar from one alternative to another due to location of resource being used, terrain characteristics, and development costs. Roads are located to minimize disturbance on the land, yet provide access to resources. Thus, road routes generally follow routes of favorable terrain where practicable.

Construction and Costs

The total costs for construction and reconstruction are shown in Table 4–18.

Table 4–18
Total Costs

Alternative	Millions of Dollars
1	0.00
2	9.17
3	10.04
4	14.34
5	10.89
6	13.35

The estimated development costs for each alternative are summarized in Table 4–19.

Table 4-19
Transportation Development and Costs by Alternative

	Alternative					
	1	*2*	*3*	*4*	*5*[1]	*6*[1]
New Construction Miles	0	52.10	58.07	80.36	60.72	70.96
Arterial	0	7.31	9.30	14.44	9.13	15.23
Collector	0	16.61	15.81	24.18	14.33	20.67
Local	0	28.18	32.96	41.74	37.26	35.06
Total Construction MM$[2]	0	8.10	9.00	12.68	9.52	11.63
Heavy Reconstruction Miles	0	0	0	0	.07	.07
Total Reconstruction MM$	0	0	0	0	.20	.20
Bridge Reconstruction	0	0	0	0	56,000	56,000
Total Bridge Recont. MM$	0	0	0	0	.06	.06
New Bridge Construction Total Bridge Const. MM$	0	.62	.60	1.12	.55	.88
Fish Timing Costs MM$	0	.20	.19	.29	.24	.26
LTF Construction MM$ Shelter Cove	0	.25	.25	.25	.25	.25
LTF Reconstruction MM$ Hume Island	0	0	0	0	.07	.07
Total Construction and Reconstruction Cost MM$	0	9.17	10.04	14.34	10.89	13.35

[1]Includes Estimate Share-Cost Dollars
[2]MM$ = Millions of Dollars

Road Development

Road development includes expansion of the current road system in all alternatives except Alternative 1.

In general, the mileage differences between existing and planned road development result from the amount and spatial arrangement of retention areas and amount of harvesting that would occur in new undeveloped areas. The proposed roads are those new roads needed for harvest of the timber volume associated with each respective alternative. The total planned roads are those roads needed to develop the remaining timber volume in the rotation associated with each alternative (see Table 4-20).

Table 4-20
Changes in Total Transportation Systems (Miles)

Alternative	Existing[1]	Proposed 1989-94	Total Planned
1	35.79	0.00	0.00
2	35.79	52.10	310.92
3	35.79	58.07	309.03
4	35.79	80.36	310.14
5	35.79	60.72	303.12
6	35.79	70.96	308.30

[1]Includes Private Roads

Expansion of the road system requires: (1) construction of varying classes of roads, i.e., arterial, collector, and local roads; (2) reconstruction of some existing roads; (3) construction and reconstruction of varying types of major drainage structures; and (4) coordination of construction activities with fish and wildlife needs.

Construction

Three classes of road would be constructed as part of the proposed project. Each class has different projected uses and construction standards. The three classes are: arterial, collector, and local roads.

Arterial and collector roads are generally mainline system roads requiring higher standards and heavier investment to provide prolonged use. These roads can be built to lower standards initially and upgraded as use is intensified. Thus the logging operator may construct arterial and collector roads to low or medium standards depending upon use.

Local roads tend to be utilized intermittently allowing use of lower standards. Thus local roads are generally less costly than the arterial and collector roads.

The development of the arterial/collector road system occurs in all alternatives except Alternative 1, the No Action Alternative. Alternatives 4 and 6 develop the most miles (80 and 71 respectively) while Alternative 2 develops the least (52 miles). Local roads will be constructed in all action alternatives. The level of local road development is not directly proportional to the level of harvest in each alternative. This is due to differing spatial arrangements of the harvest units between alternatives.

Alternative 4 contains the highest level of development, and has the highest costs. Alternative 2 contains the lowest level of development and the lowest cost. The miles and cost of roads to be developed are shown by class in Tables 4-21 and 4-22.

Table 4-21
Road Development

	Alternative					
Road Class	*1*	*2*	*3*	*4*	*5*	*6*
Arterial Miles	0	7.31	9.30	14.44	9.13	15.23
Collector Miles	0	16.61	15.81	24.18	14.33	20.67
Local Miles	0	28.18	32.96	41.74	37.26	35.06
Total	0	52.10	58.07	80.36	60.72	70.96

Table 4-22
Road and Major Drainage Structure Costs

Alternative	Millions of Dollars
1	0.00
2	8.72
3	9.60
4	13.80
5	9.81
6	12.25

Reconstruction

There may be some reconstruction associated with private roads included in Alternatives 5 and 6. This may include bridge replacement and minor blading and shaping of the existing road to the Hume Island log transfer facility.

Table 4-23 displays bridges and major culvert costs.

Table 4-23
Bridge/Reconstruction Costs

	Alternative					
Structures	*1*	*2*	*3*	*4*	*5*	*6*
New Construction	0					
Permanent	0	3	3	5	3	3
Modular	0	4	3	3	1	1
Major Culvert	0	5	4	9	5	5
Construction Cost $MM	$0.00					
Permanent[1]	$0.00	$0.35	$0.41	$0.81	$0.36	$0.19
Modular[1]	$0.00	$0.18	$0.12	$0.14	$0.04	$0.35
Major Culvert[1]	$0.00	$0.09	$0.07	$0.17	$0.09	$0.11
Subtotal MM$	$0.00	$0.62	$0.60	$1.12	$0.49	$0.65
Reconst. Costs $MM	$0.00					
Permanent	$0.00	0	0	0	0	0
Modular[1, 2]	$0.00	0	0	0	56,000	56,000
Major Culvert	$0.00	0	0	0	0	0
Subtotal MM$	$0.00	$0.00	$0.00	$0.00	$0.06	$0.06
Total Bridge Cost MM$	$0.00	$0.62	$0.60	$1.12	$0.55	$0.88

[1]Costs for permanent bridges, modular bridges, and major culverts are $2,340/LF for two-lane permanent bridge, $1,450/LF single-lane permanent bridge, $800/LF for modular bridges, and $18,400 for major culverts.

[2]Includes cost-share bridges and associated reconstruction costs.

Construction Coordination With Fish and Wildlife

Development in several areas will require road construction near inventoried eagle nest trees. The following table shows the number of new construction within 330 feet of known eagle nest trees for the total project area.

Table 4-24
Eagle Disturbance, Total Project Area (Lineal Feet)

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Feet of Proposed Road Within 330′ Buffer	0	0	0	400	0	0

The road segment identified in Alternative 4 from the above table, connects Units 24 and 25 in VCU 746.

It is normal practice to locate roads and other facilities 330 feet away from eagle nest trees unless terrain or physical requirements such as road grade prevent such avoidance.

Numerous AHMU stream crossings have been identified as needing fish timing restrictions for construction of structures (Appendix C).

The fish timing restrictions are to minimize impacts on fish eggs and fry. Generally, these restrictions can be accommodated through planning and scheduling of the construction activities. However, in many cases, additional costs would be incurred to accommodate the timing restrictions. Such costs would include additional equipment mobilization and demobilization, increased construction actions for mitigation and increased construction delays. The number of AHMU crossings and associated costs for fish timing for the total project area are displayed in Table 4-25.

Table 4-25
Fish Timing Crossings and Costs

Fish Timing Crossings	Alternative 1	2	3	4	5	6
AHMU Class I	0	12	11	20	17	16
AHMU Class II	0	3	2	6	5	3
AHMU Class III	0	4	5	2	1	6
Total Crossings	0	19	18	28	23	25
Total Cost MM$	0	0.20	0.19	0.29	0.24	0.26

VCU specific locations for fish timing sites are included in Appendix C.

Road Construction Within Stream Buffers

Roads will be put in buffers oly where it is the environmentally preferable choice. The following table presents the planned miles of road to be constructed within stream buffers. When these roads are laid out on the ground, care will be taken to keep as much of the road as possible outside of the stream buffer. In most cases, the limiting factor will be the type of terrain adjacent to the buffered stream which will govern how much of a given road segment can be located outside the buffer. This is consistent with the Tongass Timber Reform Act.

Table 4-26
Road Construction in Stream Buffers

Alternative	VCU	Road Segment Unit to Unit		Roads Parallel and in Buffers (ft.)	VCU Total Parallel To Buffers (ft.)
2	742				0
	746	Shelter Cove	746-1	500	
		746-1	746-2	2,800	
		746-2	747-6	3,400	
		746-10	746-9	3,200	9,900
	747	747-8	747-7	1,600	
		747-15	747-18	2,000	
		747-22	747-23	1,300	
		747-16	747-17	1,600	
		747-34	747-37	1,600	
		747-38	747-39	2,600	
		747-42	747-43	1,600	12,300

Table 4-26 (Continued)
Road Construction in Stream Buffers

Alternative	VCU	Road Segment Unit to Unit		Roads Parallel and in Buffers (ft.)	VCU Total Parallel To Buffers (ft.)
2 (continued)	748			0	0
	753			0	0
	Total				22,200′ 4.2 Miles
3	742				0
	746	746-3	746-4	100	
		Shelter Cove	746-11	500	
		746-11	746-12	2,800	
		746-12	747-27	3,400	6,800
	747	747-27	747-28	1,600	
		747-32	747-33	1,000	
		746-18	747-21	1,600	
		747-25	747-26	2,600	
		747-39	747-41	2,000	
		747-41	747-42	1,300	10,100
	753			0	0
	Total				16,900′ 3.2 Miles
4	742				0
	746	746-2	746-3	100	
		746-1	746-21	500	
		746-21	747-34	2,800	
		746-34	746/747-38	3,400	
		746-41	746-42	3,200	10,000
	747	747-39	747-40	1,600	
		747-47	747-48	1,600	
		747-47	747-50	2,000	
		747-49	747-50	1,300	
		746-26	747-29	1,600	
		747-30	747-32	2,600	10,700
	748			0	0
	753	753-8	753-8	800	
		753-11	753-11	800	
		753-17	753-17	600	2,200
	Total				22,900′ 4.3 Miles

Table 4-26 (Continued)
Road Construction in Stream Buffers

Alternative	VCU	Road Segment Unit to Unit		Roads Parallel and in Buffers (ft.)	VCU Total Parallel To Buffers (ft.)
5	742				0
	746	746-6	746-10	100	
		Shelter Cove	746-14	500	
		746-14	747-25	6,200	
		746-27	746-26	3,200	10,000
	747	747-20	746-18	1,600	
		747-25	747-28	1,600	
		747-31	747-33	1,000	4,200
	748			0	0
	753	753-47	753-46	800	
		753-44	753-44	800	
		753-38	753-38	600	2,200
	Total				16,400′ 3.1 Miles
6	742				0
	746	746-2	746-3	100	
		Shelter Cove	746-17	500	
		746-18	746-18	800	
		746-17	747-30	6,200	7,600
	747	747-31	747-32	1,600	
		747-35	747-36	1,000	
		747-34	747-46	2,000	
		747-46	747-45	1,300	
		747-22	747-26	1,600	
		747-27	747-28	2,600	10,100
	748			0	0
	753	753-15	753-14	800	800
	Total				18,500′ 3.5 Miles

Encumbrances

Some of the proposed activities are adjacent to or within lands that are available for selection under authority of the Alaska Native Claims Settlement Act (ANCSA) and the Alaska Statehood Act.

The State of Alaska has selected lands within the project area. These lands have been conveyed. Additionally, lands in the Coon Cove/Hume Island areas have been selected by Cape Fox Corporation. Other lands immediately north of the Coon Cove selection are available for selection under ANCSA. Subsequent discussions portray the amount, location, and effects of the encumbered lands.

Proposed Federal Activities on State of Alaska Lands

Several proposed road segments may encroach on some corners of State land northeast of Salt Lagoon. Additionally, several road segments may run through State lands directly west of the mouth of Salt Lagoon. When terrain will permit, every attempt will be made to locate roads within National Forest lands. Where encroachment or entrance on State lands is unavoidable, an easement will be sought. Table 4-27 illustrates the road segments expected to encounter State lands.

No Federal harvest activities are planned on known State land selections.

Table 4-27
Proposed Roads Within Alaska State Lands

Alternative	Road Segment Unit to Unit		Miles	Total Alternative Miles
1			0.0	0.0
2	747-11	747-12	0.1	
	747-11	747-15	0.1	
	747-26	747-27	0.2	0.4
3	747-35	747-36	0.1	
	747-36	747-41	0.1	0.2
4	747-43	747-44	0.1	
	747-44	747-47	0.1	0.2
5			0.0	0.0
6	747-39	747-41	0.1	
	747-39	747-42	0.1	
	747-52	747-53	0.1	
	747-53	747-54	0.1	0.4

Proposed Federal Action Within Alaska Native Claims Settlement Act (ANCSA) Land Selections

Within the project area, there exists an area of land that is still available for selection by local Natives as part of ANCSA. Alternatives 3, 4, 5, and 6 all have planned road construction within this ANCSA parcel.

The ANCSA parcel is located between George and Carroll Inlets, south of Saddle Lakes, and north of Hume Island LTF. These lands from upper Gunsight Creek Valley to the Cape Fox lands to the south, within Township 74 S, Range 92 E. are available for selection by Alaska Natives. Any Federal investments within these lands would be available for selection. Receipts for timber volume sold from this area will be held in escrow until selections are completed. Table 4-28 portrays the proposed harvest units and volume by alternative within the withdrawal area.

Selection of this land by the Native community, either before, during, or after planned Federal activities, could have important effects. If selected before Federal activity, planned harvest would be drastically lessened in four of the alternatives. If selected during or after planned Federal activities, many miles of road would be lost to future use and timber volume.

Table 4–28
Proposed Harvest Units Within ANCSA Withdrawal Areas (MBF)

Alternative	VCU	Units	Volume MBF
1		0	0
2		0	0
3	747	747–34	2,449.50
4	753	753–11	1,706.49
		753–12	519.92
		753–13	525.83
		753–14	1,770.21
		753–15	2,352.24
		753–16	1,630.82
		753–17	1,785.03
		753–18	556.31
		753–19	845.37
5	747	747–34	868.17
	747	747–30	2,449.50
	753	753–44	1,706.49
		753–43	519.92
		753–39	525.83
		753–40	1,770.21
		753–42	1,630.82
		753–38	1,785.03
		753–37	556.31
		753–35	855.60
		753–41	2,331.45
		753–36	1,143.24
6	747	747–34	2,449.50
	753	753–9	3,054.67
		753–10	1,223.67
		753–11	1,262.05
		753–12	402.92
		753–13	389.65

Table 4–29 summarizes the proposed timber harvest volume by alternative.

Table 4–29
Summary of Proposed Timber Harvest in ANCSA Withdrawal Areas (MBF)

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Timber Volume	0	0	2,449.5	11,692.22	16,142.57	8,782.51

Table 4-30 displays the road development, by alternative, within the ANCSA withdrawal area.

Table 4-30
Proposed Road Development Within ANCSA Withdrawal Areas (Miles)

Alternative	Road Segment Unit to Unit		Segment Length (Miles)	Total Miles
1			0.0	0.0
2			0.0	0.0
3	747-31	747-34	0.9	0.9
4	753-10	753-11	0.9	
	753-11	753-12	0.1	
	753-12	753-13	0.8	
	753-13	753-14	1.0	
	753-14	753-15	1.1	
	753-15	753-16	1.4	
	753-13	753-17	1.9	
	753-17	753-18	0.8	
	753-19	753-20	1.5	
	753-18	753-19	0.8	10.3
5	747-30	747-29	0.8	
	753-44	753-44	0.8	
	753-43	753-43	0.1	
	753-42	753-43	2.8	
	753-40	753-39	0.7	
	753-41	753-40	0.8	
	753-39	753-43	0.3	
	753-38	753-39	1.4	
	753-38	753-37	1.2	
	753-37	Hume Island	0.4	
	753-36	753-35	1.7	
	753-35	Hume Island	0.4	11.4
6	747-33	747-34	0.8	
	753-13	753-13	0.1	
	753-13	753-12	1.0	
	753-12	753-11	0.9	
	753-12	753-10	0.8	
	753-10	753-9	1.5	
	753-9	LTF	0.2	5.3

Table 4-31 displays the road costs by alternative in carrying out the proposed development on lands subject to selection under authority of ANCSA.

Table 4-31
Cost of Development on Lands in Dollars Subject to ANCSA Selections

Alternative	Road Class	Miles	Cost $
1	Arterial	0.0	0
	Collector	0.0	0
	Local	0.0	0
	Total Alternative 1	0.0	0
2	Arterial	0.0	0
	Collector	0.0	0
	Local	0.0	0
	Total Alternative 2	0.0	0
3	Arterial	0.0	0
	Collector	0.0	0
	Local	0.9	117,000
	Total Alternative 3	0.9	117,000
4	Arterial	0.0	0
	Collector	2.0	350,000
	Local	8.3	1,079,000
	Total Alternative 4	10.3	1,429,000
5	Arterial	0.0	0
	Collector	1.9	332,500
	Local	9.5	1,235,000
	Total Alternative 5	11.4	1,567,500
6	Arterial	0.0	0
	Collector	2.9	507,500
	Local	2.4	312,000
	Total Alternative 6	5.3	819,500

Naha LUD II Encroachment (VCU 742)

Alternatives 2, 3, 4, and 6 have proposed roading through the edge of VCU 742 to reach LUD III areas. The Tongass Land Management Plan allocated VCU 742 to Land Use Designation II (LUD II).

Areas allocated to LUD II are to be managed in a roadless state to retain their wildland character; however, wildlife and fish habitat improvement and primitive recreational facility development would be permitted. The following are excerpts from the TLMP 1985-86 amendment concerning road development in LUD II lands.

Roads will not be built except to serve authorized activities such as mining, power and water developments, aquaculture developments, transportation needs determined by the State of Alaska, and vital Forest transportation system linkages.

Vital Forest transportation system linkages refer to necessary additions to the permanent road network. Such linkages may be built through LUD II areas when either no other feasible land or water routes exist to access adjacent LUD III or IV areas or when it can be demonstrated that the routing through the LUD II area is clearly environmentally preferable and site-specific mitigation measures can be designed to minimize the impact of the road on the surrounding LUD II area. A clear need to build such linkages must be demonstrated through a comparative analysis of transportation alternatives during the NEPA process and must be approved by the Forest Supervisor, in consultation with the other Tongass Forest Supervisors.

Table 4-32 displays the miles of road within VCU 742. Table 4-33 displays the acres and volume accessed by alternative.

Table 4-32
Alternative Miles of Road Within VCU 742

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Miles	0	2.6	2.8	0.3	0	1.81

If all harvestable timber in the LUD III area of this plan were to be harvested, 4.5 miles of road would need to be built in VCU 742.

Table 4-33
Acres and Volume Accessible by Roads Which Enter VCU 742

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Acres	0	378	319	42	0	301
Volume (MBI)	0	11,749	10,432	1,082	0	9,090
% of Total Harvest in Alternative	0	18	17	1	0	11

Utility Facilities

Ketchikan Public Utilities operates a power transmission system from the Swan Lake Hydro Power Plant to Ketchikan. The transmission system traverses the project area and is authorized by a special use permit.

Ketchikan Public Utilities has expressed an interest in the development of roads near the transmission system. They are particularly interested in roaded access to the system for maintenance purposes. Construction near the transmission system will require careful operations to prevent any damage to the system. A number of proposed roads will cross or parallel the transmission system. Location, design and construction of these crossings or encroachments will be coordinated with Ketchikan Public Utilities prior to implementation.

Access Management

All alternatives in this plan are isolated road systems that will only be reached by boat or float plane. Thus, public access will be very limited because of the access methods available to the area. Accordingly, public use is expected to be negligible. With low public use, impacts due to increased access are also expected to be negligible. Consequently, access management will consist of leaving roads open for administrative activities.

Log Transfer Facilities

Existing and new Log Transfer Facilities (LTFs) will be required to harvest the timber scheduled in all action alternatives (see Table 4-34). Alternatives 2 through 4 require one LTF and Alternatives 5 and 6 require two LTFs.

Table 4-34
LTFs Required

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Existing Sites	0	0	0	0	1	1
Proposed Sites	0	1	1	1	1	1
Total LTF Sites	0	1	1	1	2	2

One additional transfer site will be constructed depending on the alternative chosen. Table 4-35 displays the location of existing and new log transfer sites.

Table 4-35
LTF Status and Location

		Location	
Site	**Status**	*Latitude*	*Longitude*
Hume Island #5	Existing	55°23′35″ N	131°22′00′ W
Shelter Cove #1	Proposed	55°31′17″ N	131°20′40″ W

The Cape Fox Corporation has an existing LTF near Hume Island which may feasibly serve National Forest lands in the area. Cost-sharing opportunities may be pursued with adjacent land owners. However, if equitable agreements cannot be reached, or necessary State and Federal permits cannot be obtained for use of Hume Island LTF, lands served by these facilities will require development of access via the proposed Shelter Cove LTF. This would affect Alternatives 5 and 6.

Each log transfer facility requires a log transfer area, a small airplane/boat dock, a barge off-loading ramp, and a log raft storage area. These facilities are generally located within close proximity of the transfer facility to reduce costs and retain impacts within a localized area (see Table 4-36).

Table 4-36
Log Transfer Facility Construction

Site	Transfer Method	Transfer Equipment Cost $	Site Development Cost $	Total Cost $
Hume Island #5	A-frame[1]	100,000	60,750	160,750
Shelter Cove #1	A-frame	100,000	250,000	350,000

[1]A-frame: This system consists of a stationary mast with a falling boom for lifting logs from trucks to water. This system is generally located on a shot rock embankment with a vertical bulkhead to access deep water, accommodating operations at all tidal periods.

Marine Benthic Habitat

Log transfer facilities will impact the marine benthic habitat (plants and animals that live in and on the bottom). Detailed information concerning the impacts are presented in subsequent discussions. The marine benthic habitat impacts are expected to be as follows:

1. Structural Embankment: Estimated 0.23 acres/site.
2. Site Bark Deposition: Estimated 1.96 acres/site.
3. Raft Storage Bark Deposition: Unknown.

Table 4-37
Marine Benthic Habitat Affected Acres

	Alternative 1	2	3	4	5	6
Number of Sites	0	1	1	1	2	2
Acres Affected by Structural Embankment	0	0.2	0.2	0.2	0.5	0.5
Estimated Acres Affected by Bark	0	2.0	2.0	2.0	3.9	3.9

Structural Embankment

All LTF types occupy approximately the same amount of bottom area. For instance, the float off-push in 10 percent grade system extends approximately 250 feet out into the water on a moderately sloped beach. This system is long and narrow. The steep slide and A-frame systems use more shoreline, and do not protrude out into the water as much as the float-off push-in system. Thus, all systems cover about the same bottom area.

It is expected that the float-off push-in system will cause greater impacts because this system requires more gentle sloping beaches that are generally more valuable for biological production than steep sloped beaches.

Site Bark Deposition

Two publications exist which describe some of the general effects of log transfer facilities and log storage on the marine benthic habitat. Sedell and Duval (1985) summarize the information available on the effects of log transport and storage on marine resources and fisheries. Faris and Vaughn (1985) examined log transportation and log storage in southeast Alaska.

Shultz and Berg (1976) examined 32 existing log transfer facility sites and found that 19 had bark accumulation, 8 had no bark accumulation, and 5 had traces of bark. The extent of bark accumulation ranged from 0 to 9.0 acres for 31 of the 32 sites. The 32nd site had accumulation of 182 acres that could not solely be attributed to log transfer activities. Faris and Vaughn (1985) reexamined the original data from Shultz and Berg (1976) and found that the average accumulation size was 1.96 acres for all sites excluding the 182 acre site. They speculate that bark and debris accumulation may be decreasing over time due to currents. No estimate on the length of time before a bark accumulation was completely eliminated was made.

Faris and Vaughn (1985) also examined the extent of total damage to marine benthic habitat in southeast Alaska. Their results indicate that from the 90 currently permitted sites, a total of 176 acres would be impacted (using the 1.96 acre average). This is .02 percent of the total estuarine area that is less than 60 feet deep. Moreover, when they examined all of the potential area of bark and debris accumulation from all permitted and proposed sites in southeast Alaska, including all sites proposed in the 1989–94 DEIS, they found that a total of 317 acres would be impacted. This is 0.09 percent of the total estuarine area that is less than 60 feet deep in all of southeast Alaska. This result corresponds with the conclusion of Sedell and Duval (1985) that the evidence of damage on important marine populations (bivalves, crabs, and salmonids) was inconclusive because of the small area of impact due to log transfer facilities. This evidence resulted in development of the current siting guidelines, i.e., avoiding crab habitat, shallow areas at the heads of bays, etc., and ensures that impacts would be minimized.

The major effect of bark and debris accumulation is that littleneck clams and bay mussels have been shown to be eliminated when as little as 4 to 5 inches of bark accumulates (Freese and O'Clair 1987). Further, Conlan and Ellis (1979) reported molluscs and several polychaetes were excluded by bark debris greater than 2.5 cm. in thickness and effects of bark may last several decades. From this evidence, it can be assumed that other plants and animals that live in and on the bottom (the marine benthic habitat) would rpobably suffer the same fate.

Toxic substances, occurring as leachates from bark, precipitate in saltwater; therefore, leachates do not appear to be a major problem in open water or where good circulation exists (Sedel and Duval 1985).

Recently, certain dissolved substances (hydrogen sulfide and ammonia) have been shown to occur in open spaces between pieces of bark in an accumulation of bark on the bottom (O'Clair and Freese 1988). They also state the following: It is not clear whether other toxic substances not measured in the study occur within bark accumulations. These substances do not enter the water above the bark. However, if Dungeness crabs burrow into the bark deposit, it has been demonstrated that their reproductive ability, eating habits, and overall survival can be affected. It should be noted that this type of effect has been demonstrated in only one bark accumulation field (Rowan Bay log transfer facility) and that, in general, crabs were not found in bark accumulations at a number of other log transfer facility locations. Bark obtained from underwater accumulations at existing log transfer facility locations was used in a laboratory experiment to demonstrate potential effects to Dungeness crabs if they were to burrow in bark accumulations (O'Clair and Freese 1988). It is not known whether these effects would occur for other burrowing crab species. Although king crab do not burrow, it is not clear whether this species is affected by bark and debris accumulation at log transfer facility sites.

Raft Storage Bark Deposition

The other potential effects associated with log transfer facilities are from log rafts and log storage in saltwater. The area under a log raft may be affected by bark accumulations with effects similar, but not as concentrated as those discussed for log transfer facilities. In addition, if the raft is stored in a bay or cove for a long period of time, marine algae may be affected by shading. Occasionally, rafts stored in shallow depths may ground on the bottom. This would cause mechanical disruption or compaction of inter and subtidal bottom habitats. This would be a short duration effect because recolonization would begin shortly after the raft refloated, unless the site was repeatedly used and log rafts frequently grounded. Proposed and existing log storage areas in the project area are deep enough and will not ground.

Barge log transfer facilities probably would have less effect on the marine environment than rafting log transfer facilities, although no studies are available for comparison. The rock embankment associated with the facility would be longer and slightly wider at the seaward end. The additional length and width would eliminate a larger intertidal area than a raft log transfer facility breakwater. The longer length and wider seaward end in deeper water would require dredging and filling in the subtidal area. Bark and debris would only accumulate in a small area around the extreme seaward end of the facility.

Fisheries

The effects of log transfer facilities on fisheries resources have not been quantifiably demonstrated. It is unlikely that any effects on returning adult fish would occur unless a log transfer facility or raft storage areas were immediately adjacent to an anadromous fish stream and caused blockage of entry into the stream. Juvenile pink and chum salmon that spend several months immediately after outmigration in protected bays and coves would be more likely to be affected by activities in the marine environment. These small fish are

highly mobile as they actively feed on marine invertebrates. Some of their preferred food items live on the surface of the bottom. Bark accumulation and the area under the embankment of a standard breakwater eliminates a small portion of the habitat of those food items, but is unlikely to cause measurable adverse consequences.

It has been hypothesized that the breakwater usually associated with a log transfer facility structure, regardless of whether a raft or barge can cause greater mortality of pink and chum juveniles because they are forced to move into deeper water where more predators eat them. It is not known whether this is a major source of mortality in addition to the naturally low survival rate attributed to the early marine life stage of juvenile pink and chum salmon. Because barge log transfer facilities require longer breakwaters, the probability of this effect may be increase.

There is no formal documentation that log transfer facility structures or activities associated with their use conflict with commercial fishing near the facility. If a facility were located in a small bay or cove, it is possible that there could be some difficulty maneuvering around log rafts or moored barges to get to favored fishing sites. No adverse consequences on commercial fishing or subsistence uses or marine resources are anticipated as the result of log transfer facility location.

Camps associated with a log transfer facility site can cause additional use of fisheries and marine resources. There is no data currently available on the amount of additional use occurring at various camp locations in the study area. The competition for resources at or near logging camp locations would probably increase. There is currently little or no information to indicate that resource allocation problems have occurred as the result of a logging camp. The Boards of Fisheries and Game can control the amount of harvest by setting bag limits, shortening season lengths, or by instituting a complete closure of a fishery. If resource problems arise because of increased resource pressure due to a logging camp, the Forest Service would aid the Department of Fish and Game in attempting to resolve the problem. However, it is unlikely that an allocation or utilization would progress far enough to cause adverse consequences on fisheries or marine resources.

Wildlife

From a wildlife perspective there are two types of effects associated with a log transfer facility and camp. First, is the potential loss of wildlife habitat due to clearing for the camp, sort yard, and associated facilities. Second, and most important, is the disturbance to wildlife as a result of increased human activity associated with the camp.

The amount of habitat lost is relatively minor. Whenever possible, camps and sort yard facilities are located away from the highest quality habitat. The differences between a slide and barge facility are inconsequential. The objectives are to avoid eagle nest sites and estuarine habitat.

The overall effects of disturbance of wildlife use patterns are generally minor. Most wildlife species generally adapt to increased human use quickly.

A large effect on wildlife results from the human activity associated with the camps and facilities. This includes disturbance of wildlife use patterns, increased harvest, and increased bear–human encounters.

An increase in the number of people in an area would generally increase the use of and competition for wildlife resources. However, actual harvest levels can be monitored and regulated. The influx of additional people into an area appears to have a greater potential to affect the existing users of the area than wildlife species. Consequently, adverse effects to wildlife populations are not expected by any of the terminal transfer facilities or logging camps proposed in any of the alternatives. For additional information on the effects of the proposed alternatives on existing users, see the ANILCA Section 810 Subsistence Evaluation and Finding in Chapter 4.2.

Visual

The large size, linear bold shape, and saltwater location of log transfer facilities generally present a very strong visual impact when viewed within a foreground distance. Their relatively low profile, however, helps to mitigate the visual impacts when viewed from a distance. The three log transfer facility design alternatives being considered share similar components that offer the same visual impacts. Clearings for sort yards and logging camps are approximately the same size and are located on fairly level or gently sloping sites which helps to absorb much of their visual contrasts when viewed from saltwater. Floating logging camps are also being considered. Visual impacts from these are considered much less than more permanent upland camps.

Slide type log transfer facilities usually present less of a visual impact than barge facilities. The bold form of the bulkhead associated with barge log transfer facilities prevents it from blending into the surrounding landscape. Often the type of material and the color of the bulkhead creates strong contrasts that can be seen even in the background distance zone.

Individual Sites

Following is a discussion of the major resource concerns for the individual site displayed in Appendix C. A more extensive evaluation with respect to the interagency LTF siting guidelines is also included in Appendix C.

Shelter Cove #1

The new log transfer facility in Carroll Inlet would be built at Site 1 (VCU 746). Bark and debris accumulations over approximately two acres could cover highly productive bottom habitat. The site is located outside of Shelter Cove away from anadromous fish streams; therefore, it is unlikely there would be effects on returning adult fish.

A boat and plane access float would be located within Shelter Cove adjacent to the LTF access road.

Carroll Inlet is a large waterway near the proposed log transfer facility, thus the facility should not impact navigation.

Camp Facilities

The project area is largely inaccessible except by boat or float plane. Only the western portions of VCU 748 is connected to the greater Ketchikan Area road system. The isolated nature of the area will require use of remote camps for both road building contractors and logging operators. Either land based camps, floating camps, or combinations thereof will be used to accommodate the proposed activities. Additionally, maintenance shops and oil storage facilities for each operator are required. All of these facilities are generally located within close proximity of the LTF to reduce development costs and disturbance impacts.

Generally, float camps consist of a floating residential facility with maintenance shops and fuel storage facilities on the uplands. Each upland camp will require three to six acres of flat to moderately sloped land suitable for development. Land area needed is dependent upon the camp size, facility configuration or type, and topographical characteristics.

Depending upon timber sale scheduling, use of multiple LTF sites and segregated road systems, several float or land based camps could be used concurrently.

Alternatives 1 through 6 would concentrate camps at Shelter Cove. Alternatives 5 and 6 would have camps at both Shelter Cove and Hume Island LTF sites.

Joint Facility Use Opportunities

Joint facility use opportunities consist of Right-of-Way Acquisition and Share-Cost.

There are several opportunities for using privately owned LTF sites and road systems in the project area. The opportunities include possible joint use of road and LTF facilities operated by Cape Fox Corporation in Carroll and George Inlets. These facilities lie south of the National Forest lands in the area. Both LTF and road systems could feasibly serve

the proposed actions in all the alternatives. Possible options are feasible share-cost agreements or right-of-way acquisition through negotiations or condemnation.

Description of requirements concerning use and development on private land:

Hume Island LTF:
- Acquire use of existing LTF.
- Acquire use of upland fuel storage and shop area.
- Acquire use of upland camp area.
- Acquire use and reconstruct 0.87 miles of existing road.
- Acquire route and construct 0.15 miles of new road from the National Forest border to the existing Cape Fox road.

Right-of-Way Acquisition

Right-of-way acquisition through condemnation is generally unfavorable unless there are no other access routes available for serving National Forest lands. Shelter Cove and South Island Point have been identified as suitable access points on National Forest land. Accordingly, right-of-way acquisition by condemnation is eliminated from further consideration.

Share-cost

Share-cost is the cooperative sharing of the costs and uses of facilities, usually roads or terminal facilities. These agreements are mutually advantageous to both parties, particularly in saving costs in constructing and operating a joint road system. Share-cost agreements can also provide opportunities to reduce environmental impacts particularly in reducing need for duplicate road systems.

Share-cost negotiations can be complicated, time consuming, and require much coordination to conclude. Additionally, share-cost possibilities may not be of mutual benefit to both parties, thus negating such possibilities. Negotiations could begin upon signature of the "Record of Decision."

If share-cost agreements are not mutually desirable, the viability of this option is eliminated. The Forest Service will then need to transport all resources through the proposed Shelter Cove LTF.

Following are discussions pertaining to share-cost possibilities associated with each alternative.

Alternative 1 would not require any access. This is a No Action Alternative.

Alternative 2 is planned to be accessed via Shelter Cove. This alternative emphasizes economics. Use of privately owned facilities would create excessive haul and construction costs.

Alternative 3 is planned to be accessed via Shelter Cove. This alternative emphasizes recreation and road development that would be advantageous for future recreation uses. There is an opportunity to obtain access via Coon Cove which would provide greater flexibility in timber harvest scheduling. However, if Coon Cove access is used, it is probable that the road segment between Units 747–27 and 746–12 would not be constructed for timber operations. This segment is most desirable for future recreational uses and is slightly more economical for timber development.

Alternative 4 is planned to be accessed via Shelter Cove. This alternative emphasizes timber output. There is an opportunity to connect to the privately owned Hume Island LTF, which would provide greater flexibility in timber sale scheduling depending upon the time required for negotiating and concluding a share-cost agreement. The economics of using one or two LTF sites would depend upon a favorable share-cost agreement.

Alternative 5 is planned to be accessed via Shelter Cove and Hume Island. Access via the privately owned Hume Island LTF will require a share-cost agreement for joint use. Use of

both Hume Island and Shelter Cove LTF sites may provide greater flexibility in scheduling timber harvest sales. However, should an equitable share-cost agreement be unobtainable, particularly within a reasonable time frame, nine harvest units and adjacent remaining timber will be isolated from water access unless connected to the Shelter Cove system. Haul to Shelter Cove would require construction of a road link between harvest units 746–6 and 753–14. Such a link would create a road pattern similar to Alternative 4. This link will be constructed under this alternative if an equitable agreement cannot be reached within a reasonable time frame. Linking the southern area to the Shelter Cove system would be favorable for administrative purposes as segregated road systems limit or hinder administrative access.

Alternative 6 is planned to be accessed via Shelter Cove and Hume Island. Alternative 6 would be in a similar situation as presented previously in the discussion concerning Alternative 5. If a share-cost agreement is not obtainable within a reasonable time frame, a road link between harvest units 746–6 and 753–14 would be needed for access via Shelter Cove.

Timber

The Timber section addresses the following aspects of timber management: timber stand productivity, distribution of harvest by volume class, isolation of timber, financial analysis and socio-economic effects, resource coordination needs, regeneration, firewood cutting, and long-term and cumulative effects.

Timber Stand Productivity

Each action alternative results in an increase in merchantable timber volume due to the conversion of old-growth climax stands to even-aged young-growth stands. In old-growth climax stands, annual growth is offset by mortality so that net growth is zero (Hutchison and Labau 1975). In contrast, young-growth stands will produce, on a 100-year rotation on an average site, about double the cubic foot volume maintained in most old-growth stands (Taylor 1934).

A further increase in the production of merchantable wood, under each of the action alternatives, is expected from precommercially thinning the second-growth stands as they mature. Precommercial thinning is the silvicultural practice of removing some trees of less than marketable size from the stand so that the remaining trees grow faster. Precommercial thinning, as a management practice, is usually implemented when the young stands are 15 to 20 years of age. It is estimated that precommercially thinning one acre would permit an increase in one year's timber harvest of 5.4 MBF (Tongass Land Management Plan, Page H3). Based on the management assumption that precommercial thinning will be applied to the more productive sites (volume class 5, 6 and 7) and that 40 percent of these acres (about 608 to 988 acres depending upon the action alternative) are precommercially thinned, the potential increase in production of merchantable wood due to precommercial thinning would be approximately 33.2 to 58.2 MMBF over the rotation period (see Table 4–39).

Each of the action alternatives would result in decreased levels of humus buildup. Growing sites are improved and made more favorable for spruce when excessive buildups of raw humus are reduced (Ruth and Harris 1979). Large quantities of plant nutrients are tied up in the organic matter and these nutrients are made available to the plants only through decomposition, a process that is temperature dependent (Harris and Farr 1974). Humus buildup is reversed when the site is exposed to full sunlight after logging.

Distribution of Harvest by Volume Class

Distribution of Harvest by Volume Class

Implementation direction in regard to the Tongass Land Management Plan timber program was provided by the Alaska Region in November 1984 (Tongass Land Management Plan Evaluation Report). This direction included information concerning acres and percentages of the timber volume classes that should be harvested over the life of the

Tongass Land Management plan as part of programmed harvest. These goals along with accomplishments for the first 5 years of the plan can be found on pages 94 through 96 of the Tongass Land Management Plan evaluation Report.

Table 4-38 displays the volume class occurrence of the two management areas within the Shelter Cove project.

Table 4-38
Volume Class Occurrence by Management Area (Percent of Total Acres)

Management Area	Volume Class	%
K35	4/5	95
	6/7	5
K39	4/5	86
	6/7	14

Table 4-39 displays the volume class composition in acres scheduled for harvest by alternative, and the total volume by volume class scheduled for harvest.

Table 4-39
Harvest Distribution by Volume Class

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Acres:						
Volume Class 4	0	360	602	1,133	875	990
Volume Class 5	0	1,476	1,444	2,183	1,672	1,810
Volume Class 6	0	300	101	286	34	220
Volume Class 7	0	55	84	1	0	41
Total Harvest	0	2,191	2,231	3,603	2,581	3,061
MBF:						
Volume Class 4	0	6,510	10,880	20,212	15,847	18,244
Volume Class 5	0	44,220	43,269	65,405	50,083	54,243
Volume Class 6	0	10,422	3,500	9,936	1,171	7,625
Volume Class 7	0	2,753	4,170	51	0	2,011
Total Harvest	0	63,905	61,819	95,604	67,101	82,123

Table 4-40 displays the volume class proportion by alternative for each management area as a percentage of total acres harvested. Only Alternative 2 harvests a disproportional amount of old-growth timber in volume classes 6 and 7.

Table 4-40
Volume Class Proportion by Alternative by Management Area (Percent of Total Acres)

Alternative	Management Area	Volume Class	%
2	K35	4/5	92
		6/7	8
	K39	4/5	81
		6/7	19
3	K35	4/5	99
		6/7	1
	K39	4/5	89
		6/7	11
4	K35	4/5	97
		6/7	3
	K39	4/5	85
		6/7	15
5	K35	4/5	100
		6/7	0
	K39	4/5	96
		6/7	4
6	K35	4/5	97
		6/7	3
	K39	4/5	87
		6/7	13

Isolation of Timber

Isolation of Timber

Stands of timber can be isolated, or be made difficult to access in an economic and physical sense. An example of isolation of timber stands is where harvest units are designed and laid out without adequate consideration for the future access of adjacent timber. Designing a unit for highlead logging where terrain and resource protection considerations would allow a longer reach skyline system to be used, often isolates timber. The consequences of isolation of timber may include the following:

- Additional roading with its associated costs and environmental impacts may be required in the future to access timber which could have been reached from one road with a complete setting. When additional road construction is not feasible, aerial logging systems, such as helicopter, may be required in the future to access isolated timber.
- The short-term operation costs of logging partial settings may be reduced, but the long-term costs may increase substantially if isolated timber is eventually harvested.

To facilitate the development of harvest alternatives and to prevent the isolation of timber stands, a Logging Systems Transportation Analysis was used. The Logging System Transportation Analysis identifies where the operable Commercial Forest Land is and identifies the logging system settings and road networks required to access the operable Commercial Forest Land.

Standard logging practices in southeast Alaska require setting boundaries to be placed in logical locations dependent upon topography and the type of logging system. Windfirm cutting boundaries were used where possible to minimize future windthrow. Aerial photography, topographic maps, and ground reconnaissance were used to develop the Logging Systems Transportation Analysis.

Harvest units were developed for each alternative by selecting combinations of settings and roads. As alternatives were developed, adjustments were made to settings and road locations on the basis of resource protection considerations. Additional minor adjustments to unit design are expected to occur as units and roads are laid out to meet on-the-ground conditions and to meet mitigation requirements.

Financial Analysis and Socio-Economic Effects

Financial Analysis and Socio-Economic Effects

A financial analysis was performed on each harvest alternative which schedules new volume for timber harvest. Alternative 1, which does not schedule any volume for timber harvest, is not included in this analysis. The purpose of the financial analysis is to provide a means of comparing the economics of each alternative under mid-market conditions.

The data used to develop timber values for mid-market conditions is based on historical appraisal data. The market condition is defined as follows:

> Mid-Market—The value and product mix that most closely matches the point between the ranked quarters of the Alaska Index Operation end product selling price less manufacturing cost (pond log value), adjusted to current dollars (1986), where one half of the timber has been removed at higher values and product mix and one half of the timber has been removed at lower values and product mix, during the period from 1979 to the current quarter. Where more than one quarter could meet the above definition, the quarter with the most current data is used.

The costs of timber harvesting are directly influenced by the volume class distribution in each alternative. Low volume stands are more expensive to harvest due to lower volumes per acre and smaller logs. Low volume stands have fewer trees per acre, and the trees contain more small logs. The cost of harvesting timber is also influenced by the method, or logging system, used to yard the timber.

Timber values are also related to volume class, as well as to species composition and market conditions. Logs from low volume stands tend to be smaller and have lower grade quality.

In addition to volume class and species composition, timber values are also related to prevailing market conditions and the international demand for the cants and pulp produced after local processing. After the poor market conditions that occurred in the early 1980s, conditions have improved steadily. The market at this time is considered to be above a mid-market condition.

Table 4–41 summarizes the results of the financial analysis. The actual appraised rates will be determined by using appraisal data in effect at the time of appraisal.

The following are a definition of the terms used in Table 4–41:

- The mid-market pond log values are estimates of the dollar values for the timber volume processed into final products less manufacturing costs. Final products are pulp, lumber, or cants from hemlock and spruce. The final products for western redcedar and Alaska yellow-cedar logs are considered export logs for the purpose of this analysis.
- The road construction and LTF costs allow for construction costs of roads, drainage structures, and log transfer facilities.
- Haul, dump, raft, and tow costs include the costs of transporting the logs on log trucks to the log transfer facility, transferring the logs to the water and then towing the logs to a mill.
- The market conversion is the net dollar value of the timber volume calculated by subtracting all the above costs from the pond log value. The market conversion rate is the conversion dollar value divided by the timber volume.

Table 4–41
Financial Analysis Summary

	Alternative					
Components	*1*	*2*	*3*	*4*	*5*	*6*
Sawlog MBF	0	66,773	64,935	99,832	69,961	85,276
Mid-Market Pond Log Value (MM$)	0	21.4	21.1	32.2	22.8	27.5
Stump to Truck Logging Costs (MM$)	0	9.3	9.1	15.4	10.5	12.7
Road Construction Costs, LTFs (MM$)	0	9.2	10.0	14.3	10.9	13.4
Haul, Dump, Raft and Tow Costs (MM$)	0	2.3	1.8	4.2	2.2	2.5
Mid-Market Conversion (MM$)	0	0.6	0.2	–1.7	–0.8	–1.1
Mid-Market Conversion Rate $/MBF	0	9.0	3.1	–17.0	–11.4	–12.9

Action Alternatives 2 and 3 show a positive conversion rate for mid-market conditions. Alternatives 4 through 6 show a negative conversion for mid-market conditions.

Alternative 2 has the highest mid-market conversion rate. Alternatives 3, 5, 6, and 4 rank, in order or decreasing economics, second, third, fourth and fifth respectively for mid-market conditions.

The road system developed in each alternative is a capital investment that is attributed to each alternative in the financial analysis. But the road system, while considered a short-term cost in the financial analysis, is also a benefit because the road is in place for future timber transport and forest management. Therefore, some portion of the costs reflected in Table 4–41 could actually be attributed to future timber harvest and management.

Another benefit not reflected by the financial analysis is the value of the multiple uses of these roads other than their use in transporting of timber. The construction and maintenance of roads to transport timber would, in the future, help provide access to potential recreation sites throughout the project area.

Other timber-related values not addressed in Table 4–41 are socio-economic in nature. With the exception of Alternative 1, the alternatives are not expected to result in dramatically different socio-economic values. The following values are estimates over a 5-year period and based on a average annual timber harvest of 8 million board feet. It is assumed that 8.5 jobs are created per million feet of timber harvested.

1. 65–70 direct and indirect private-sector jobs annually, over a 5-year period, as a result of the harvest, transport, processing and export of timber.
2. $2,600,000–$3,150,000 annual value to local communities and lifestyles from wages paid. The 5-year aggregate value amounts to $13,000,000–$15,750,000.
3. $1,950,000–$2,362,500 paid in Federal Income Tax on wages, in aggregate.
4. $45,435,000–$55,000,000 gross peak aggregate value to businesses and communities, as wages are spent and respent over the period of 1990–2000.

Alternative 1, which does not schedule harvest activity, would not provide the benefits described above.

The timber harvest scheduled by Alternative 2 through 6 is expected to yield an additional long-term socio-economic benefit to future generations of forest users. The timber stands scheduled in these alternatives vary in age from 100 years or less, to 800 years of age or more. Such timber stands show the most vigorous and uniform growth during the first 100 years. Conversely, timber stands of a more advanced age often reflect less than the true timber productivity of a particular growing site, due to the effects of defect, insect infestations, disease and competition. Because of such defect, 40–60 percent of existing stands is currently processed for a dissolving pulp end product, rather than the more valuable cant end product. The harvest of these older stands results in the establishment of young stands with vigorous growth rates and uniform production.

Tree thinning on the better growing sites, early in the new cycle, will further enhance the growth-rate, species composition, and uniformity of the new stands. As a result, these new stands may be expected to produce a greater quantity of merchantable forest products. While second-growth stands do not have the occasional large trees found in old-growth stands, they contain in total more uniform larger trees that are less costly to harvest, transport and process, and a larger proportion of more valuable spruce trees.

Table 4–42 projects only the increase in growth and yield that may be expected by alternative over a new 100-year growth cycle. In this projection, existing stands that have volumes to 20–30 MBF/acre and 30–50 MBF/acre cannot be distinguished from one another on the basis of future growth potential. Such stands are aggregated into a single 20–30/30–50 MBF/acre growth class for purposes of this projection. Forty percent of the acreage of each alternative is scheduled for precommercial tree thinning treatment (designated in Table 4–42 with [P*] at year 15–20).

The expected 100-year yield from each growth class is as follows:

8–20	36.2 MBF/Acre
20–30/30–50	43.4 MBF/Acre
50+	52.0 MBF/Acre
20–30/30–50 [P*]	49.0 MBF/Acre
50+ [P*]	57.8 MBF/Acre

As displayed in Table 4–42, an average of roughly 57 percent increased growth and yield may be expected as a result of implementation of Alternatives 2 through 6 on the project area. Alternative 6 yielded the largest percent increase.

Table 4-42
Growth and Yield Projected for the Years 2090-2099 from Harvested Acres

	Alternative 1	2	3	4	5	6
Acres by Volume Class						
8-20	0	360	602	1133	875	990
20-30/30-50	0	1066	927	1481	1024	1218
50+	0	33	50	1	0	25
20-30/30-50 [P*]	0	710	618	988	682	812
50+ [P*]	0	22	34	0	0	16
Projected Yield MMBF in Year 2090-2099						
8-20	0	13.0	21.8	41.0	31.7	35.8
20-30/30-50	0	46.3	40.2	64.3	44.4	52.9
50+	0	1.7	2.6	.1	.0	1.3
20-30/30-50 [P*]	0	34.8	30.3	48.4	33.4	39.8
50+ [P*]	0	1.3	2.0	.0	.0	9.2
Total Projected Yield in MMBF (2090-2099)	0	97.1	96.9	153.8	109.5	139.0
Total Initial Yield in MMBF (1990-2000)	0	63.9	61.8	95.6	67.1	82.1
Increased Growth/Yield in MMBF	0	33.2	35.1	58.2	33.4	56.9
Increased Growth/Yield in Percent		51.9%	56.8%	60.9%	36.2%	69.3%

[P*] = Acres to be Scheduled for precommercial thinning @ year 15-20.

Resource Coordination

The Tongass Land Management Plan did not schedule for harvest some of the operable commercial Forest Lands in LUDs III and IV to meet other resource coordination needs. Table 4-43 displays acres reserved from harvest during this planning period to meet resource coordination needs by alternative in this document.

Table 4-43
Retention to Meet Other Resource Needs

	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6		TLMP	
	Acres	*MMBF*	*Acres*	*MMBF*	*Acres*	*MMBF*	*Acres*	*MMBF*	*Acres*	*MMBF*	*Acres*	*MMBF*	*Acres*	*MMBF*
Wildlife: Old-Growth Retention	0	0	2566	89	3768	130	2864	98	5805	199	3006	104	3752	109
Fisheries: Buffer*	0	0	443	13	443	13	443	13	443	13	443	13	0	0
Total	0	0	3009	102	4211	143	3307	111	6248	212	3449	117	3752	109

*Does not include 409 acres, 12.8 MMBF of AHMU Class I, II, and III habitat within wildlife retention areas.

Regeneration

Law, regulation, and policy require that timber be harvested from National Forest System land only where there is assurance that such land can be adequately restocked within 5 years after harvest. This may be accomplished by natural or artificial regeneration. Based on past experience, the Forest Service estimates less than 1 percent of the acres proposed for harvest would need to be artificially regenerated.

Firewood Cutting

Free use firewood is available to individuals on National Forest system land. Although there is a high demand for firewood, lack of access to the project area from Ketchikan makes firewood gathering impossible.

Should the project area be linked to Ketchikan with a tie road, firewood would become readily available from the road system. Future firewood availability would increase with future timber entries.

Cumulative Effects

The open conditions created in clearcuts in all action alternatives will allow both Sitka spruce and western hemlock to regenerate rapidly. Even-aged stands usually contain from 10 to 75 percent spruce depending on the soil type and the age of the stand. On average, the volume of spruce in even-aged stands 75 to 100 years after harvest is about 50 percent (Taylor 1934) compared to 28 percent in existing mature and overmature stands. Based on Ketchikan pre and post thinning data collection the practice of precommercial thinning results in an additional 20 percent increase in the spruce component over unmanaged stands.

Although log quality in second-growth stands is expected to be lower than in mature and overmature stands, even on sites that have been precommercially thinned, total yield per acre is expected to be higher in second-growth stands. The lower quality will be reflected in the log grades (sizes), with second-growth timber stands having fewer higher grade logs than existing mature and overmature stands. In addition, second-growth stands will have less volume in the larger diameter classes. Nevertheless, total yield per acre will be significantly greater in second-growth stands than in mature and overmature stands. The long-term result of precommercial thinning is the production of more useable fiber. Precommercial thinning also allows the Forest Service the option of reducing the rotation age because merchantable size logs are produced sooner on thinned sites than in areas not thinned. The Tongass Land Management Plan calls for precommercial thinning on approximately 6,300 acres per year.

Most second-growth stands will exhibit less variation in tree diameter and height than the mature and overmature stands they replace. For unmanaged second-growth stands average diameters will range from 10.5 inches on the poorer sites (site index 85) to 17.2 inches on the best sites at 100 years of age (site index 140) (Taylor 1934). With several precommercial thinnings it is possible to produce average stand diameters that approximate old-growth averages. On the better sites average diameters of 20 to 21 inches are possible in 100 to 110 years (Forest Service Handbook 2409.26d)

Table 4–44 displays timber scheduled for harvest through 2060. It assumes an even rate of harvest through the rotation, approximately 10 to 15 percent of the available acreage would be scheduled for harvest in one decade.

Table 4-44
Timber Harvest Scheduled Through 2060 (Acres)

Alternative	Remaining Operable Acres at End of This Planning Period	Timber Harvest in Acres by Time Period 2000–2010	2010–2060
1	19,285	0	0
2	14,085	1,408	12,677
3	12,843	1,284	11,559
4	12,375	1,238	11,137
5	10,456	1,047	9,409
6	12,775	1,278	11,497

The above acres reflect retention.

The cumulative effects resulting from timber harvest throughout the rotation are not expected to change relative to the effects of any of the action alternatives. The result being the conversion of climax forest stands into young, successional stands. Within 10 to 30 years a closed canopy forest occupies the site. Such a forest stand would mature in about 100 years and reach its present climax stage in 300 to 500 years if unaltered by future harvest. Projected increases in yield due to precommercial thinning is assumed to apply.

Cultural

Logging activities, such as the use of heavy equipment, development of skid trails, construction of log transfer facilities (LTFs), and the falling of trees can result in ground scarification, the destruction of surface features, and the displacement of artifacts. Associated road construction could result in even more deleterious effects upon cultural resources. In addition to the direct impacts mentioned above, indirect impacts upon cultural resources could include vandalism and the exposure of sites to natural weathering processes. One of the management goals of the Forest is to minimize these impacts without hampering the harvest of marketable timber.

In order to accomplish this goal, each of the proposed management alternatives for the sale area were evaluated in terms of its potential impact upon cultural resources. These evaluations are based on what is now known of the nature of cultural resources of the area. This information has been issued in the *Cultural Resources Overview of the Tongass National Forest* (Arndt, Sackett and Ketz 1987) and is not repeated in this document. The conclusions and recommendations from the Overview are employed presently to assess the alternatives. Few archaeological investigations have been conducted within the study area (Ackerman and Shaw 1978, Sealaska 1975, Hurley 1988). However, enough is known of the general nature of cultural resources to develop the criteria which were used to evaluate each of the proposed timber harvest units and road segments. Harvest units were assigned either a High (occurrence of cultural resources is likely) or Low (occurrence of cultural resources is unlikely) Sensitivity value loosely based on the following criteria:

Elevation

The majority of cultural resources occur along the coast. Although the potential exists for certain types of sites to be found inland (e.g., Early Man sites, portages, trails, hunting, trapping, mines/quarries), to date none have been verified above 500 feet in elevation. Thus, areas below 500 feet, combined with the following factors, are considered likely site locations.

Slope

Areas with a slope of 40 percent or less are considered to be suitable site locations.

Water

Units in close proximity to the coast, anadromous fish streams or lakes are likely site locations.

All proposed cutting units and road construction areas were evaluated individually according to the above criteria, and those which qualified as existing in areas highly sensitive to cultural resources are tabulated by unit and alternative (see Table 4-45. In each alternative road length was converted to acres (allowing for a 200 foot wide right-of-way) to facilitate a quantitative assessment. Proposed LTFs were automatically assigned a High Sensitivity value because of their proximity to the shore and intertidal areas.

Table 4-45

Acreage of Proposed Development in Zone of High Sensitivity

Development by VCU		Alternative 1	2	3	4	5	6
742	Road Construction	0	6.06	0.00	12.12	0.00	12.12
746	Timber Harvest	0	145.10	178.40	505.16	383.99	406.64
	Road Construction	0	121.21	266.66	478.79	236.36	224.24
	LTF Construction	0	30.00	30.00	30.00	30.00	30.00
747	Timber Harvest	0	489.39	467.62	457.16	299.44	652.79
	Road Construction	0	254.55	327.27	224.24	309.09	339.39
753	Timber Harvest	0	0.00	0.00	602.30	599.29	393.93
	Road Construction	0	0.00	0.00	181.82	151.52	163.64
Total High Sensitivity Acres		0	1,046.31	1,269.95	2,491.59	2,009.69	2,222.75

Consequences of the Alternatives

All acreages are based on the volume summary issued on March 29, 1990. One presently known site may be affected, either directly or indirectly by project activities. This site will have to be evaluated by cultural resource specialists prior to project implementation. Of the action alternatives, it is clear that Alternative 2 would potentially have the least amount of impact upon cultural resources; Alternative 4 would potentially have the heaviest impact. Alternatives 3, 5, and 6 (from lesser to greater potential impact, respectively) fall in between.

In accordance with cultural resource laws and policies (the American Antiquities Act of 1906, the National Historic Preservation Act of 1966, the American Indian Religious Freedom Act, and 36 CFR 800), protection of cultural resources, preferably through avoidance and protection is desirable. Once a Record of Decision is issued, an inventory plan will be developed. In this inventory plan, the methods of locating historic and prehistoric sites within the project area prior to project implementation will be determined. The inventory plan is to be based upon the Research Design which was developed for the 1989-94 KPC Long-Term Sale and has previously been submitted to the Alaska State Historic Preservation Officer (SHPO). All high probability areas, and a portion of low probability areas will be targeted for field review prior to project implementation. Field review includes systematic pedestrian examination of the ground surface, and subsurface examination where necessary to ensure that the goal of the survey ("project clearance") is accomplished. Project clearance surveys shall be designed and carried out to ensure that all cultural resources that might qualify for the National Register of Historic Places are located in the area of potential effect of project activities.

Fisheries

Large Organic Debris

Large organic debris (LOD), sometimes called Large Woody Debris, has been identified as a very significant component of rearing fish habitat (Hartmann and Holtby 1982; Sedell and Swanson 1984; Schwan et al. 1985; Heifetz et al. 1986). The definition the American Fisheries Society uses to define LOD is "Any large piece of relatively stable woody material having a least diameter greater than 10cm and a length greater than 1m that intrudes into the stream channel." LOD, in southeast Alaska, has been shown to be a necessary component in the over-winter survival of coho salmon and steelhead trout (Heifetz et al. 1986).

A technique to provide sources of LOD and maintain channel stability is to leave a zone of uncut forest along the stream channel. Complete, uncut buffer strips have been evaluated by a number of researchers (Erman et al. 1977; Heifetz et al. 1986) and found to be an effective technique in managing for the protection of stream courses from the adverse effects of timber harvest. Buffer strips in southeast Alaska can be prone to blowdown from major storm events. This blowdown timber can provide a large amount of rearing cover for coho salmon without causing channel disruption or migration.

Sedell and Swanson (1984) recommend a managed streamside zone where standing timber is partially harvested. This will open up the canopy, insure future LOD input and maintain bank stability. They speculate this management technique will not only prevent adverse effects to fish habitat from timber harvest, but may allow a sustained increase in fish production from the stream system. It has been shown that fish production in numbers and biomass increase when clearcut timber harvest opens the streamside canopy (Scriverner and Andersen 1982; Elliot 1983, unpublished; Bisson and Sedell 1984; Koski et al. 1984; Grant et al. 1986). It has also been shown by Koski et al. (1984) that the production gained in the summer was lost over the winter due to the absence of pools and LOD.

Standards and Guidelines listed in Chapter 2 for harvest units within the AHMU would be used to maintain instream and future sources of LOD and to maintain channel stability.

Windthrow of Trees

Windthrow of trees is a natural phenomenon in southeast Alaska. Harvest of timber often increases windthrow potential to the remaining trees. This is sometimes common when streamside buffers are retained to provide for future LOD recruitment. Site-specific fisheries standards may be written to meet the objectives of the mitigation measures and reduce the windthrow hazard. In addition, the boundary of the retained vegetation may be moved away from the stream, to a maximum distance of the entire AHMU, to provide windfirmness (1989–94 KPC FEIS, p. 4–153). The area of greatest concern is the floodplain section (C3 channel type) on lower Salt Creek. Clearcutting on both sides of the stream, in conjunction with the road corridor, will create potential for blowdown in the large riparian leave area along this productive salmon stream. So Alternative 2 poses the highest blowdown potential. Alternatives 4 and 6 also harvest simultaneously on both sides, but to a lesser degree than Alternative 2. Since Alternative 3 logs primarily on one side, the overall hazard is much less. Alternative 5, which puts this the whole area in older stand management, precludes accelerated windthrow hazards.

Stream Temperature

Fish survival and condition are influenced by both summer high and winter low temperatures. Temperature extremes can affect egg survival, growth rates, overall health of the juveniles, and adult fish survivals. Temperature is an important factor for migration timing of adult spawners, incubation (development and emergence timing) of eggs in stream gravels (see Alaska State Water Quality Standards 18 ACC 70), and feeding and growth of rearing fry and juvenile fish. Streamside forest vegetation plays an important role in regulating heat exchange on small forested streams by providing overstory cover that maintains water temperature within the evolutionary range of fish (Beschta and Platts 1986). The effects of timber harvest are generally related to thermal stress of anadromous fish due to elevated water temperature or lower amounts of dissolved oxygen in the summer, and the loss of eggs and fry (young fish) in the winter due to anchor ice (the freezing

of inter-gravel water) (1989–94 KPC FEIS p. 4-149). For the analysis of this document, stream systems that exhibited summer temperature sensitivity are also considered sensitive to winter temperature extremes.

The magnitude of temperature change in a stream is inversely proportional to the water discharge and directly related to surface area exposed by clearcutting (Brown and Krygier 1970). This means that small streams with relatively large surface area and low water volume are the most susceptible to heat gains or loss. Within the Shelter Cove Sale area only the Nigelius Creek drainage is considered temperature sensitive.

The alternatives with the most timber harvest units would create the greatest temperature increases. Generally, the mapped streams will not have problems with temperature increases, as the "buffers" established along the stream banks will prevent excessive increased summer water temperatures. The unmapped streams that are class III streams, i.e., those that run water during the summer but do not have either resident fish or anadromous, will be most subject to increased water temperatures. These increases will be short lived, as the streams that fall in this category are very small, less than 3 meters, and usually less than 1 meter in width during the summer months. Streamside vegetation that has reached the height of 4 meters will provide sufficient shade for a 10 foot wide stream. The streamside trees will reach this height in ten years. For the small streams, those less than 3 feet wide the streamside shrub vegetation will provide ample shade, even directly after harvest. The following table compares the alternatives potential to elevate summer stream temperatures.

Table 4-46

Comparison of Timber Harvest Adjacent to or in AHMU (Units in Thousands of Feet)

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
I[1]	0	31.5	31.7	56.6	62.4	31.6
II[1]	0	10.2	10.0	13.6	12.1	14.1
III[2]	0	31.0	36.3	30.1	50.1	31.1
Total	0	72.7	78.0	120.3	105.6	103.3
Rank	1	2	3	7	5	4

[1] 100 foot or wider buffer.

[2] No planned buffer, but site-specific conditions may require a vegetative leave area.

None of the alternatives are predicted to have a potential to elevate stream temperatures to a level where they could exacerbate fish mortality problems due to low oxygen levels in the water. This is particularly true of the area, except for Salt Creek, as no streams have high number of adult pink or chum salmon escapement, so the problem of high adult salmon respiration rates depleting the dissolved oxygen amounts in the streams should not occur.

Currently aquatic research speculates that increased winter stream temperatures caused by timber harvest in southeast Alaska may cause early fry emergence from spawning gravels (Elliot 1985, unpublished; Schwan et al. 1985). This early emergence could cause washout of coho fry during spring runoff and/or cause pink and chum fry to encounter a reduced food supply in estuaries. However, in stream systems where there is sufficient over-winter habitat increased stream temperatures which lead to early coho fry emergence may provide for a longer growing season for the rearing juveniles. This could lead to increased coho smolt production which may in turn lead to an increase in returning adult spawners (Schwan et al. 1985). This is similar to Sedell and Swanson's (1984) hypothesis presented in their discussion of active streamside management. It can be assumed that with effective

streamside management where large organic debris (LOD) is maintained and future sources of LOD are ensured, timber harvest would not cause adverse consequences on fisheries habitat due to an increase in winter stream temperatures.

Summer migration barriers can occur when adult fish refuse to enter streams with excessively high temperatures. Fish kills have been reported in streams when adult fish succumb to a lack of dissolved oxygen in streams with excessively high temperatures. The current Standards and Guidelines for timber harvest along temperature sensitive streams are designed to prevent adverse impacts on fish or fish habitat potential from elevated summer temperatures or depressed winter temperatures. The current standard is to retain 75 percent of the streamside/shade producing vegetation (AHMU vegetation). This will prevent degradation of the stream habitat if the overall watershed harvest level does not exceed 25 percent. This standard may require additional restrictions for timber harvest on moderate and high gradient channels.

Primary Productivity

Timber harvest management has positive short-term effects, but negative long-term effects on the streams primary productivity. By increasing the amount of light reaching the stream there will be an increase in primary productivity by algae and other periphyton. This in turn provides for an increase in secondary productivity by insects and other invertebrates. But after about 15–20 years the dense second-growth shades the streams reducing primary productivity below levels in old-growth forests (Gregory 1982).

Fish Passage

Fish passage is the ability of both adults and juveniles to move both up and downstream. For adults, this most often means the ability to reach spawning gravels. For juveniles, this is the ability to reach suitable, seasonally required habitat. Stream crossing standards and guidelines are designed to provide fish passage where needed.

Many of the streams do not have anadromous fish passage, due to waterfall or cascade barriers. Of the streams exhibiting these barriers, only Salt Creek (where a barrier to pink and chum salmon exists between the Salt Lagoon and Salt Lake), and Nigelius Creek have a potential to have a positive benefit to cost ratio. Timber sale receipts provide an opportunity to fund the construction of fish passage structures at the two waterfall sites. All alternatives, except for Alternative 5, provide opportunities to collect timber funds for construction of the Salt Creek fish passage structure.

Camp Effects

The log camp, which will be placed on Shelter Cove should not affect the commercial fishery, but could potentially impact the local sports fishery, personal use and subsistence fishery.

Logging camps concentrate sportfishing and subsistence use in the vicinity of the harvest area. This could potentially pose risk to the population viability of isolated runs of anadromous fish within the project area. This is particularly true of the small population of summer run coho that spawn and rear in Salt Creek. These fish are highly susceptible to sport angling and poaching, due to the low stream flows occurring in Salt Creek during the summer months. The road system accessing Salt Creek (all alternatives except for Alternative 5), would exacerbate the potential to depress the Salt Creek coho population. Construction of a fishway at the falls would partially mitigate the impacts of additional angling pressure, by allowing the coho to pass over the falls and into the Salt Creeks, over a wider range of stream flows. The impacts on the different fisheries and subsistence uses are directly related to the length of time the camps stay in one area.

Sediment Impacts

The consequences of habitat disruption on fish production and impairment of water quality due to disturbance of an aquatic system depend upon: (1) the magnitude, duration, and location of the disturbance in a watershed, (2) the season in which the disruption occurs, (3) the interaction between natural and human-caused events, and (4) the type of

forest practice conducted in the streamside zone. In general, the short-term effects of timber harvest on the catch of desirable fish species cannot be measured unless compounding effects such as weather, ocean survival, or other types of environmental disturbance can be determined. Without streamside management prescriptions or post harvest mitigation, longer term changes may cause stream system specific declines in fish species. Streamside management prescriptions will be used to protect channel stability, water quality, fisheries habitat, and produce timber volume from streamside zones in the short term.

Disruption of channel or watershed stability has the potential to reduce the habitat capability of stream systems. The consequences of disturbing the existing balance within stream systems can include gravel scour, discharge changes, bedload movement, loss of woody structure and sediment deposition. The management activities that have the greatest potential for AHMU disturbance include activities on high gradient channels (increase stream energy delivered downstream), activities on alluvial fans (reduce energy dissipation), and activities that disturb channel banks and/or LOD. Disruption of channel banks or in-place LOD should not occur under the standards and guidelines, and the consequences of these activities are short term when compared to energy-related consequences.

Roads can also affect fish habitat through the introduction of fine sediments, increases in landslides due to road location and design, and re-routing of existing small water channels. Some of these effects can be mitigated by proper sizing and location of roads and culverts, end hauling of excavated materials on steepened slopes, and the presence of an adequate buffer between roads and fish streams. Still, the most pronounced effects occur at stream crossings. This is mitigated by choosing as many crossings as possible to take place on less sensitive channels, or less sensitive inclusions within sensitive channels.

Working instream when adult fish are migrating to the spawning grounds, or when eggs are incubating in the gravel can result in losses in the productivity of the stream on a short-term basis. These short-term impacts can become significant when management decisions which do not follow timing guidelines become commonplace, rather than the exception, and the crossings are located at the most productive spawning areas. The adherence to best management practices and guidelines outlined in the Aquatic Habitat Management Handbook (64.13b—1 to 64.15a) will prevent this occurrence from being commonplace. Table 4-47 gives an approximate ranking of potential habitat disruption by stream crossings. Also, impacts to high value fish habitat in Salt Creek from unplanned veents such as culvert washouts, bridge construction impacts, are higher for Alternatives 2, 3, 4, and 6. Even so, the ranking puts Alternative 5 as "middle ranked."

Table 4-47

Number of Road Crossings Affecting Fish Habitat by Stream Class

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
I	0	12	11	20	17	16
II	0	3	2	6	5	3
III	0	4	5	2	1	6
Total	0	19	18	28	23	25
Rank	1	3	2	6	4	5

Habitat Capability

The Potential Management Indicator Species (PMIS) will be used to evaluate the environmental consequences of the alternatives on fish habitat capability. The fish PMIS for this project area are coho salmon, pink salmon, and Dolly Varden char.

Coho Habitat Capability

Coho salmon are highly dependent on quality rearing habitat for their health, growth, freshwater survival, and marine survival. Coho juveniles spend 1-2 years in freshwater before migrating to saltwater, as out-migrating smolts. The quantity and quality of year-round rearing habitat are the basis of the production potential of streams. For coho salmon, the number of out-migrating smolts produced by the stream system is directly related to the winter survival of the juveniles; and the number of adult coho available to the subsistence, sport, and commercial fishery as well as the brood stock escapement is directly related to the number of out-migrating smolts.

LOD is critical in providing both quantity and quality of rearing habitat for juvenile coho salmon. LOD serves both as a source of nutrients and as a structural component within and adjacent to the stream channel (Bryant 1983). The survival of the coho juveniles depend on the deep, quiet pools created by LOD, undercut banks, backwater sloughs and channels, and large bottom substrates (Heifetz et al. 1986). Reduction in LOD recruitment, disturbance of off-channel habitat, and a decrease in winter stream temperatures are directly influenced by management activities, such as timber harvesting.

Coho habitat capability is directly influenced by LOD recruitment. There is the potential for reduction of key habitat components, for juvenile coho, with regards to disturbance of off-channel habitat and unmappable low gradient tributaries. Management influence on off-channel habitat usually consists of bank disturbance, small logging debris loading of these habitats, and sedimentation or disturbance from upstream activities. Winter is often a limiting factor for juvenile cohos and salmon eggs, health and survival.

Coho habitat can be expected to change over time, following clearcut harvest to the streambank. Since all class I streams and class II streams directly tributary to class I streams have 100 foot buffers designed to provide sources of long term woody debris, no impacts are expected (Murphy et al. 1987; Hartmann et al. 1987).

The potential gain from the Nigelius Creek fishway, which has yet to be verified as a feasible project, has not been factored into the assessment. The project will be evaluated in a site-specific analysis at a later date. The very rough estimate, based on coho and sockeye salmon production models, is the area upstream from the falls barrier would be 3,070 coho and 9,300 sockeye. The determination of the feasibility of the project would be based on the benefits, i.e., the amount of coho and sockeye produced for subsistence, sport, and commercial harvest worth the cost of construction, maintenance, and monitoring the project.

The Salt Creek falls has been determined to not be a barrier to coho salmon. Gains from fish passage construction would be accrued from increased pink and chum salmon production. The gain would benefit primarily commercial fishermen. Spot and subsistence fishermen do not target either of those fish. See pink capability analysis for production capability and the potential impact frtom the Salt Creek falls modification. Also not taken into account is the possible reduction of coho smolts from an excessive harvest of spawning adults within Salt Creek from increased recreational and sport fishing associated with the logging camp activities.

In summary, the potential to reduce coho habitat capability is mitigated by the effective protection of off channel habitat, protection from impacts to winter stream temperatures due to harvest activities, and protection from impacts due to upstream activities. These impacts will be directly related to the effectiveness of implementation of the Standards and Guidelines.

Pink Habitat Capability

Substrate composition, water quality and quantity, water depth and velocity are important habitat components for salmonid spawning and successful incubation of eggs to fry. Spawning generally occurs in riffles, with preferred sites occurring at the pool-riffle interface. A constant supply of clean well-oxygenated water is critical to the survival of eggs incubating in the gravels. Unlike coho, pink and chum salmon fry do not spend a 1–2 years rearing in freshwater. Not long after emergence from the gravels pink and chum fry start their out-migration to saltwater. The emergence and out-migration of pink fry is heaviest during the dark of the night and usually lasts for several weeks before all fry have emerged.

Management actions which could potentially affect pink habitat capability are those that would alter migration of juveniles and adults, or affect the spawning and incubation habitat.

Management activities that would potentially affect spawning and incubation habitat are those that increase stream sediment levels, or destabilization of stream spawning habitat. The increase in stream sediment levels can affect egg survival.

Management activities that would potentially affect migration of juveniles and adults are those that impact fish passage, reduce migratory holding areas, and/or increase stream temperature in staging areas. Migratory holding areas are those deep quiet pools where adults school up to rest. These areas potentially can be reduced by changes in streambank stability, lateral scouring (widening and shallowing), and changes in sediment and bedload routing. Bank stability and lateral scouring are influenced by the amount of harvest near the stream. Watershed stability and LOD influence influence changes in sediment and bedload routing.

Research studies have been conducted on southeast Alaska pink salmon, including the relationship between stream sediment, egg survival, and pink salmon returns to streams (Sheridan et al. 1966; Pella and Myren 1974; Sheridan and McNeil 1982). None of the studies have provided conclusive tie between upland management and reduced numbers of returning fish. This may be because of the accuracy of the information, or the overriding limiting factor for pink salmon returning to southeast Alaska's streams is ocean survival. Ocean survival may be influenced by food sources, predators, offshore and near shore commercial fish harvests, water temperatures, and many other factors.

In summary, pink habitat capability to produce fry migrating to the ocean is potentially at risk from onsite and upstream impacts. Standards and guidelines for the project proposal and the use of Best Management Practices is predicted to maintain current capability. Potential impacts will be directly related to the effectiveness of implementation of the Standards and Guidelines. Potential gain in pink and chum habitat production could occur by constructing a fish pass over the lower Salt Creek interfall. This would open approximately 2.6 acres of spawning habitat to adult pink and chum salmon. The potential net gain is estimated at 14,030 pink salmon and 7,200 chum salmon.

Dolly Varden Habitat Capability

Substrate composition, water quality and quantity, water depth and velocity are also important habitat components for Dolly Varden, as well as salmon, spawning and successful incubation of eggs to fry. Dolly Varden, like coho salmon, are highly dependent on quality rearing habitat for their health, growth, freshwater survival, and marine survival. Dolly Varden juveniles spend 1–4 years in freshwater before migrating to saltwater, as out-migrating smolts. Dolly Varden habitat needs are much like that of the coho salmon, with the exception that some Dolly Varden may live their whole life in freshwater. Dolly Varden habitat capability like coho habitat capability is directly influenced by LOD recruitment.

In summary, the risk to Dolly Varden habitat capability is much like that of the coho habitat capability. There needs to be effective protection of off channel habitat, protection from impacts to winter stream temperatures due to harvest activities, and protection from

impacts due to upstream activities. These impacts will be directly related to the effectiveness of implementation of the Standards and Guidelines.

Cumulative Effects on Fish Habitat

A way to analyze the cumulative impacts on fish habitat is to consider the amount of the Aquatic Habitat Management Unit that would remain at the end of the rotation. Since the passage of the Tongass Timber Reform Act of 1990, all class I and class II streams will have 100 foot or greater width buffers. It is unlikely that any reduction in woody debris sources would occur, since research shows that 100 percent of the woody debris in streams originates from within 100 feet of the stream.

The management prescriptions emphasize the design of windfirm buffer areas, but from knowledge of past activities, it is likely that some unplanned, or accelerated windthrow will occur. Windthrow timber, when left in the stream, continues to provide habitat associated with large woody debris. However, over the very long term (50 to 150 years), some reduction in habitat capability may occur as the large woody debris decays.

No quantified cumulative impacts from timber harvest and road building were developed. But with greater percentages of an area potentally harvested, the higher the risk of unplanned impacts to fish habitat capability, and a greater overall potential for cumulative watershed effects reducing fish habitat capability. This could be particularly true for watersheds that have a combination of Forest Service and Native ownerships. It is assumed that a high percentage of the operable timber will be harvested on Native ownership. The new State Forest Practices Act requires similar streamside prescriptions, buffers on anadromous and major sport fish streams.

Using the assumption that there is a higher risk of unplanned impacts to fish habtiat when a greater percentage of a watershed is harvested, the alternatives can be ranked. The following table shows the cumulative total harvest within the planning area.

Table 4-48
Acres of Watersheds Harvested by Alternative

Alternative	Acres This Planning Period	To End of Rotation	State/ Private Harvest	Total	Rank
1	0	0	9,024	9,024	1
2	2,191	12,677	9,024	23,892	6
3	2,231	11,559	9,024	22,814	3
4	3,603	11,137	9,024	23,764	4
5	2,581	9,409	9,024	21,014	2
6	3,061	11,497	9,024	23,582	5

The old-growth retention proposals are also considered in analyzing cumulative effects. Since the Salt Creek watershed has the highest production capability of watershed within the Shelter Cove area, alternatives with least harvest would have the least potential for unplanned impacts to fish habitat capability.

Table 4-49
Total Retention of Old Growth in Salt Creek Drainage

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Acres	2,368	654	1,428	813	2,337	1,053
Rank	1	6	3	5	2	4

Wildlife

The scoping process determined that the potential effects of timber management activities on wildlife habitats and populations, particularly old-growth dependent species, were of major concern. This section documents the effects of the proposed alternatives on wildlife through the use of Management Indicator Species and effective blocks of productive old-growth forest.

Habitat Capability and Animal Populations

The terms "habitat capability" (suitability) and "population" are usually not interchangeable. Habitat capability is synonymous with carrying capacity or the maximum number of animals the habitat can support, during a typical year, whereas the population is the number of animals actually present at a given time. Populations may temporarily exceed habitat capability (e.g., due to a series of mild winters). However, most populations are usually below what the habitat is capable of producing, due to predation, winter mortality, or other ecological factors.

When old-growth habitats are harvested, the habitat capability for species associated with old growth will decline. If the population is near carrying capacity, the population will also decline. If the population is below carrying capacity, timber harvest may not affect the present population. However, the potential of the population to recover following a decline (e.g., as caused by a severe winter) will usually be reduced where timber harvest has occurred.

Wildlife Models were used as a reference for estimating the acres of suitable habitat per Management Indicator Species (MIS) in the project area and for calculating rough population estimates-habitat capabilities. The Geographic Information System (GIS) data base was queried for acres of habitat per MIS. These acres were then multiplied by the Species Density factors listed in each model. Also, for three MIS affected by old-growth patch size, the proportion of acres at different effectiveness owing to block size was calculated.

Limitations of the Analysis

For several reasons the acres of suitable habitat and population estimates should be interpreted with caution.

First, ecological relationships between animals and their habitats are complex. Animal populations vary with habitats and ecological conditions; this analysis cannot exactly mirror natural relationships. The analysis simplified the dynamics of populations, and the habitat relationships addressed are inexact.

Second, analysis of the relationships between southeast Alaska wildlife species and their habitats is difficult due to incomplete information. This analysis uses the best information available. However, the data often are highly variable, have been collected in localized areas, and may not apply to the specific situation being examined.

Given data limitations, actual population sizes in small areas may vary considerably from those predicted by this analysis. However, the procedures provide the best available, at the present time, estimate of general population trends in response to habitat change.

Today, wildlife management encompasses a much broader spectrum of concerns with more emphasis being placed on a broad-based ecosystem approach to management rather than a single species approach. Wildlife in Alaska is an important economic, aesthetic, recreational resource, and a sensitive barometer of the environment on which we all depend. Maintaining biological diversity through wise land management planning is a way to maintain Alaska's wildlife legacy for future generations.

Conservation Biology

Wildlife managers and ecologists are becoming involved in a field called conservation biology which is an applied science directed towards maintaining genetic diversity of species and the integrity of ecosystems. The principles of conservation biology must be incorporated into our wildlife management if we are to maintain Alaska's unique biodiversity. Such conservation will require blending of diverse disciplines of genetics, demography, and community ecology.

Biological diversity is important because the loss of one component of an ecological community may cause the entire community to unravel. There are many complex interrelationships among organisms which make up most communities. An example would be the important role of large trees in an old-growth forest in providing habitat for mammals, birds, and fish. As the trees die and are slowly decomposed and recycled through the ecosystem, they become inhabited by an entirely new flora and fauna.

The extinction of species is a serious and irreversible threat to the long-term well being of humans. Habitat loss and fragmentation are the greatest cause of extinction today. Fragmentation occurs whenever a large contiguous habitat, such as the old-growth block located north of Salt Lagoon, is transformed into smaller patches that are isolated from each other by catastrophic windstorms or clearcutting. The changed landscape functions as a barrier to dispersal for species associated with the original habitat. These smaller and more isolated habitats also support smaller populations, which are more vulnerable to local extinction, thereby causing the smaller, more isolated habitats to contain fewer forest species. The scientific literature describes many examples where fragmentation of formerly widespread terrestrial habitats, into remnants of various sizes and degrees of isolation, has resulted in the extinction of species from blocks of remaining habitat.

Most species persist regionally as sets of populations that are linked by dispersing individuals. This dispersing allows for the recolonization of unoccupied habitat patches after local extinction events. A reduction in suitable habitat patches, or a loss of biological corridors, can disrupt the dispersing dynamics and contribute to regional extinction of species. The interconnecting, landscape matrix facilitates the recolonization from surviving neighboring populations. The LUD II (Naha area) acts as the regional center (habitat refugia) for old-growth dependent populations, while the nearby Old-growth Retention of Alternatives 5 produces old-growth wildlife and provides a biological corridor to vacant, suitable habitats. Consequently, the landscape of old-growth retention, located north of Salt Lagoon, facilitating the recolonization of neighboring populations as the habitat becomes suitable in the future. With this connection to the Naha area, the old-growth block located north of Salt Lagoon would be able to provide wildlife for future utilization in George and Carrol Inlets. Without this connection, wildlife would end up being isolated in the Naha area and less able to disperse to areas where they could be utilized.

Research shows that forest fragmentation results in an increased ratio of forest edge to forest interior and can have a strong negative effect on forest-interior species. As more edge habitat becomes available as a result of fragmentation, the edge-dwelling species invade the interior environment and become a major threat to the survival of the forest interior dwelling species. By maintaining large contiguous blocks of habitat, the forest interior dwelling species would realize less competition and predation from open-forest and edge species.

Habitat blocks are a key component of a conservation strategy to assure the long-term persistence of a given species that is subject to widespread, systematic reduction in the amount of its suitable habitat. The large tract of Old-growth Retention, proposed between the Naha and George Inlet and Carroll Inlet, will also help to insure adequate wildlife resources for subsistence and recreation.

Old-Growth Prescription

There are many significant values associated with old-growth forests, such as biological diversity, wildlife and fisheries habitat, recreation, aesthetic, soil productivity, water quality, and timber. The Tongass Land Management Plan withdrew some of the operable commercial forest for resource coordination needs, principally for wildlife and fish which depend upon old-growth habitat for their survival. The withdrawn areas are called "old-growth prescription" areas.

The Tongass Land Management Plan estimated that 3,752 acres of operable CFL would need to be withdrawn from the operable timber base of the project area to meet other resource needs. The action alternatives plan 2,566 to 5,805 acres of old-growth prescription.

Old-Growth Prescription Areas (blocks)

Blocks of old-growth habitat become less useful for most old-growth dependent wildlife species as the blocks of old-growth become smaller or narrower. The microclimate within old growth is affected by adjacent openings for 300 to 800 feet into the old-growth stand. Also, blowdown occurs adjacent to openings, especially new openings. Historically such blowdown has been harvested by expanding the old clearcut, which results in a new sharp edge and additional unravelling of the old-growth stand.

Reducing the size of an old-growth block reduces the likelihood that the block provides enough foraging area to support reproduction by an old-growth dependent species, or a clearcut may eliminate some critical attribute within the old-growth block. Behavioral or energy-efficiency limitations often prevent an old-growth species from crossing an opening to feed in a separate stand of old growth. Because the numbers of individuals of old-growth wildlife in a reduced block are fewer, and individuals often have trouble travelling between residual blocks of old growth, chances of inbreeding and local extinctions increase. The species most affected by forest fragmentation, along with estimates of the smallest minimum optimum sizes of relatively contiguous old-growth blocks, are goshawk (40,000–100,000 acres), Sitka deer (1,000 acres), marbled murrelet (600 acres), and pine marten (180 to 40,000 acres).

Prior to this planning period, specific areas of old-growth prescription were designated for the Brown Mountain Area (in the Brown Mountain Environmental Assessment). Additional areas of old-growth prescription were proposed for this project area. The criteria used for the selection of these areas is as follows: 1) plant association, 2) volume class, 3) aspect, 4) elevation, 5) potential block size (large blocks to decrease fragmentation), 6) proximity and biological corridors to other old-growth areas, 7) proximity to riparian travel corridors, and 8) known importance for old-growth dependent species. The blocks of old growth were designated with letters A to H and rank (from 0 to 8 in increasing value with ADF&G consultation) by wildlife species, as illustrated in the following table.

Table 4-50

Old-Growth Areas Ranked by Wildlife Species

Species	A	B	C	D	E	F	G	H
Bald Eagle	0	8	0	0	0	0	0	0
Sitka Black-tailed Deer	8	7	2	4	5	1	6	3
Boreal Owl and Goshawk	7	1	8	5	6	4	3	2
Pine Marten	3	4	7	5	8	6	2	1
Vancouver Canada Goose	8	1	3	6	2	7	5	4
Marbled Murrelet	8	7	6	5	2	4	1	3
Totals	34	28	26	25	23	22	17	13

Description of Old-Growth Blocks

The locations of the old-growth blocks are illustrated on a map (Figure 4–20 in the Maps document) and described in the following section.

Block A

1) Block A is located at the head of George Inlet—Salt Lagoon (adjacent to a proposed State Wildlife Habitat Area)
2) contains a watershed
3) contains a travelway into a high use estuary
4) is important because of the direct access to old-growth forest from the saltwater for Sitka black-tailed deer, raptors, Vancouver Canada geese, and marbled murrelets (White River, Coon Cove and areas of Salt Lagoon have been logged)

Block B

1) Block B contains the beach fringe along the west side of Carroll Inlet
2) the block is adjacent to saltwater and is low in elevation
3) area is important for bald eagle nesting, feeding and perching sites,is important deer winter range and contains potential marbled murrelet nesting habitat

Block C

1) Block C is located south of Saddle Lakes, is bordered by four lakes, and rises in elevation in the center of the block
2) is important habitat for old-growth forest raptors, and pine marten
3) contains a corridor from saltwater for marbled murrelets

Block D

1) Block D surrounds the large lake to the north of Salt Lagoon
2) when considered in conjunction with Block A, provides habitat for marbled murrelets and Vancouver Canada geese
3) when considered in conjunction with Block A, area contains enough habitat for wide ranging old-growth forest raptors and pine marten

Block E

1) Block E connects with Block A and LUD 2
2) is an important travelway between George Inlet and the LUD 2 land
3) contains low elevation, south aspect old growth
4) contains habitat for pine marten (more isolation from trapping pressure), old-growth raptors, and deer winter range
5) when combined with adjacent old-growth blocks, provides enough habitat for goshawks and boreal owls

Block F

1) Block F borders an alluvial fan and connects with block D
2) contains habitat for Vancouver Canada geese, pine marten, marbled murrelets, old-growth forest raptors

Block G

1) Block G is adjacent to Salt Lagoon, Block A and connects to LUD 2
2) the block would provide an old-growth corridor between the Estuary of Salt Lagoon and the LUD 2 (second growth is located to the south of this block)
3) contains habitat for pine marten, Vancouver Canada geese, and deer

Block H

1) Block H represents old growth adjoining the beach fringe, buffering State land, and surrounding Buckhorn Lake
2) contains habitat for Vancouver Canada geese, deer and marbled murrelets

Block I

1) Block I represents old growth previously selected in the Brown Mountain EA
2) no changes were made to these designated areas

Old-Growth Analysis

A standardized location for old-growth prescription was used for all alternatives. Harvest units were "cut out" of the blocks of old-growth prescription. The old-growth prescription was further refined by taking the "cut out" pattern and determining effective blocks of old growth. The effective blocks varied in location and number of acres per alternative (Table 4-51 and Figures 4-21 to 4-25 in the Maps document). The effective block procedure results in contiguous blocks of old-growth prescription and future harvesting could occur between harvest units. Table 4-51 displays acres of old-growth prescription. The effective blocks of old-growth prescription are referred to during the discussions of cumulative effects.

Table 4-51

Acres of Wildlife Old Growth in Old-Growth Blocks by Alternative and Ranked by Average Value Per Acre

Block	Alternative 1	2	3	4	5	6
A	956	289	653	61	935	241
B	928	928	922	870	928	928
C	1,353	192	493	0	924	572
D	321	266	339	0	321	338
E	364	37	388	388	364	364
F	394	0	48	0	394	0
G	1,099	0	0	818	1,099	0
H	822	652	723	525	638	361
I	202	202	202	202	202	202
Total	6,439	2,566	3,768	2,864	5,805	3,006
Average Value*	Good	Worst	Fair	Worst	Good	Poor

* Average value per acre within stand old-growth habitat and block size. (Based upon first letters of alphabet.)

Alternative 5 protects the important biological values in the Assessment Area by staying out of the north end of VCU 747, which is packed with prime wildlife and fish habitats: (1) travel corridors from Naha LUD II to VCUs 747, 746 and 748; (2) the largest contiguous block of old-growth habitat in the Shelter Cove Assessment Area, e.g., adequately large to support wildlife species that require very large blocks of habitat (goshawks, boreal owls, and perhaps necessary for pine marten); (3) this large contiguous block of old growth connects to the old growth within the Naha LUD II, thereby resulting in an old-growth block that better assures perpetuation of the forest-interior species over the long term; (4) prime deer and marten habitats; (5) priority 1 habitat in Forest Habitat Integration Program; and (6) an unusually high density of prime riparian habitats and prime anadromous fish habitat, which will be costly and very difficult to fully protect under the intensive roading and harvesting planned by most alternatives for the northern portion of VCU 747. In contrast, the remainder of the Assessment Area is removed from the old-growth habitat block, and has old-growth forest in blocks too small to support all wildlife species though they are still suitable for timber harvest.

Management Indicator Species (MIS)

Management Indicator Species (MIS) are species of vertebrates or invertebrates whose population changes are believed to indicate the effect of land management activities. The MIS are used to establish the requirements for maintenance of population viability and biological diversity and to establish management goals for species in public demand.

For each MIS, effects analyses are discussed for current conditions, the year 2000, and general projections for 2060. The subsistence section of this chapter contains a more in depth analysis of cumulative effects on Sitka black-tailed deer, pine marten, black bear, and river otter. Acres of habitat have been calculated for each of the MIS (Tables 4-52 to 4-53). Rough population estimates habitat capabilities have been calculated for all of the MIS except Vancouver Canada goose (Tables 4-54a and 4-54b). The habitat capabilities are to indicate population trends, not exact number of animals.

Table 4-52

Acres of Habitat by Species in the Year 2000

	Alternative					
Species	*1*	*2*	*3*	*4*	*5*	*6*
Black bear	2263	2241	2251	2162	2241	2242
Bald eagle	2028	2006	2016	1945	2006	2007
River otter	2171	2149	2159	2088	2149	2150
Vancouver Canada goose	1378	1356	1368	1334	1356	1357

Table 4-52a

Acres of Habitat for Sitka Black-Tailed Deer, and Mean Effectiveness Owing to Habitat Patch Size in the Year 2000

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Less than 800 ft.*	16023	14539	14594	13017	13980	13635
Greater than 800 ft.*	11796	11091	10994	11198	11258	11122
Mean Habitat Effectiveness (%)	53	44	48	43	51	46

* In elevation.

Table 4-52b

Acres of Habitat for Pine Marten, and Mean Effectiveness Owing to Habitat Patch Size in the Year 2000

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Total Acres	25628	23464	23407	22035	23058	22578
Mean Habitat Effectiveness (%)	95	59	78	56	89	70

Table 4-52c

Acres of Habitat for Hairy Woodpecker, and Mean Effectiveness Owing to Habitat Patch Size in the Year 2000

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Total Acres	22269	20219	20204	18767	19806	19322
Mean Habitat Effectiveness (%)	73	50	59	55	70	53

Table 4-53

Percent of Total Acres of Habitat by Species in the Year 2000

	Alternative					
Species	*1*	*2*	*3*	*4*	*5*	*6*
Deer (<800 ft. elevation)	100	91	91	81	87	85
Deer (>800 ft. elevation)	100	94	93	95	95	94
Pine marten	100	92	91	86	90	88
Black bear	100	99	99	96	99	99
Bald eagle	100	99	99	96	99	99
River otter	100	99	99	96	99	99
Hairy woodpecker	100	91	91	84	89	87
Vancouver Canada goose	100	98	99	97	98	98

Table 4-54a

National Forest Habitat Capability in the Year 2000 (Number of Animals)

	Alternative					
Species	*1*	*2*	*3*	*4*	*5*	*6*
Deer (all elevations)*	1807	1408	1523	1280	1567	1400
Pine marten*	76	43	57	39	64	50
Black bear	87	79	82	79	86	80
Bald eagle	73	73	73	70	73	73
River otter	11	11	11	11	11	11
Hairy woodpecker*	464	288	344	304	406	298

* Block size effects incorporated.

Table 4-54b

National Forest Habitat Capability in the Year 2060[1] (Number of Animals)

	Alternative					
Species	*1*	*2*	*3*	*4*	*5*	*6*
Deer (all elevations)[2]	1807	524	601	543	732	552
Pine marten[3]	76	3	6	5	24	5
Black bear	87	53	56	53	60	54
Bald eagle	73	73	73	70	73	73
River otter	11	11	11	11	11	11
Hairy woodpecker[2]	464	137	173	144	233	150

[1] Assuming all operable acres harvested, except old-growth retention and riparian AHMU buffers.
[2] Block size effects incorporated.
[3] Block size and road density effects incorporated.

Table 4-54b assumes the harvest of all operable old growth on all State and private land. This is the worst case analysis.

Sitka Black-tailed Deer

Forest Service and Alaska Department of Fish and Game biologists have developed a habitat capability model to predict the short- and long-term effects of timber harvest on deer. This analysis uses information supplied by a computerized Geographic Information System (GIS) to provide site-specific information and to predict impacts. The analysis for this project uses volume class, elevation, snow depth and block size effectiveness. The acres of habitat and habitat capability are basic figures. Aspect and forest type variables in the deer model were not calculated for this analysis.

This section deals with the effects of timber harvest on habitat capability, short-term effects, general cumulative effects, effects of timber harvest on deer hunting, human demand for deer, and effects of adjacent private property forest management on deer and hunters.

The effects of timber harvest on habitat capability are as follows:

Sitka black-tailed deer populations are highly dynamic and can display large fluctuations (Merrian 1970). The capability of winter habitat to support Sitka black-tailed deer is a function of forage abundance and quality (Hanley et al. 1987), snow interception qualities of the overstory (Hanley and Rose 1987; Kirchhoff and Schoen 1987), and climate as influenced by aspect, elevation, and maritime conditions (Hanley and Rose 1987). Deer populations also respond to predation pressure and hunting mortality. Predation by gray wolves is thought to significantly retard the recovery of the deer herd from mortality associated with deep-snow winters (Smith et al. 1986). In most cases, timber harvest reduces the long-term quality of deer winter range. The combination of deep-snow winters and large amounts of winter deer range converted to second-growth compounds impacts to deer populations. Even under unlogged conditions, a deep-snow winter can kill many deer. Clearcuts and second growth provide little snow interception above forage and, therefore, greatly increase effects of snow. Winter severity of an area is a key factor in determining the capability of the land to support deer populations.

Schoen et al. (1985) examined the weather record for southeast Alaska and concluded: "Although weather records indicate that heavy snows can occur throughout southeast, it is difficult to predict when and how frequently such events will occur."

Annual snowfall is a good index of winter severity for deer in southeast Alaska (Flynn and Kirchhoff in prep.). The ADF&G has given a snowfall rating, in terms of typical winter severity, to each VCU on the Tongass National Forest. The VCUs for this project area were

rated as intermediate snowfall VCUs. Additional details regarding snow depth rates are contained in the 1989–94 KPC FEIS (pages 4–194 to 4–197).

Short-Term Effects

Timber harvest converts old growth into early successional shrub and forb stages. Clearcuts 0–15 (Yeo 1989) years old provide abundant forage and improve the opportunity for more deer to enter the winter in good condition, but lack canopy cover to intercept snow, thereby making herbaceous forage unavailable during intermediate or deep-snow winters. Also, forage in clearcuts is not as nutritious to deer as that from an old-growth forest.

The effects of the action alternatives in the year 2000 on deer habitat quality are quantified by acres of habitat and are summarized in Tables 4–55 and 4–56.

Table 4–55

Sitka Black-tailed Deer (Acres of Habitat)*

	Alternative					
Volume Class	*1*	*2*	*3*	*4*	*5*	*6*
4	6179	5917	5766	5140	5411	5366
5	8889	7845	7955	7108	7643	7447
6	791	619	722	606	762	667
7	164	158	151	163	164	155
Total	16023	14539	14594	13017	13980	13635

*CFL acres below 800 feet in elevation.

Table 4–56

Sitka Black-tailed Deer (Acres of Habitat)*

	Alternative					
Volume Class	*1*	*2*	*3*	*4*	*5*	*6*
4	5288	5191	5099	5193	5181	5111
5	5845	5408	5335	5443	5419	5476
6	447	325	415	346	442	351
7	216	167	145	216	216	184
Total	11796	11091	10994	11198	11258	11122

*CFL acres above 800 feet in elevation and below 1200 feet.

Today (1990), there are 16,023 acres of Sitka black-tailed deer habitat below 800 feet in elevation and 11,796 acres above 800 feet in elevation. The action alternatives schedule harvest between 9 and 19 percent (1,429 to 3,006 acres) of the volume class 4–7 below 800 feet in elevation. The action alternatives schedule between 5 and 14 percent (538 to 1,683 acres) of the volume class 4–7 above 800 feet in elevation.

The habitat capability for Sitka black-tailed deer was calculated using 100 deer per square mile under intermediate snow levels as cited in the Deer Model (Suring et al. 1988b). The habitat capability in the year 2000 for the action alternatives ranges between 1,280 and 1,567 which is 66 to 84 percent of the present population.

Cumulative Effects

The cumulative effects analysis assumes the following: 1) adherence to TLMP harvest projections and current placement of old-growth prescription areas, and 2) all operable

commercial forest land not in old-growth prescription will be harvested, except portions of areas designated as extended rotation or nonstandard operable.

Deer habitat capability and deer populations in the project area will be affected by timber harvest. In the long term, timber harvest converts old-growth stands into even-aged, closed-canopy stands from 25 through 100 years. The closed-canopy stands provide thermal cover, but eliminate preferred browse species and therefore, reduces habitat capability for deer.

An important way of analyzing cumulative effects on Sitka black-tailed deer is to consider the area of old-growth prescription which would remain at the end of rotation. The amount of designated old-growth prescription that would remain at the end of rotation varies per alternative. The old-growth blocks have been prioritized for Sitka black-tailed deer (Table 4-50) and acres remaining in each block are listed (Table 4-51) by alternative. Old-growth Blocks A and B are listed as having the highest priority for deer. The action alternatives would have from 935 (Alternative 5) to 61 acres (Alternative 4) remaining in the Old-growth Block A. Old-growth Block B contains acres of beach fringe which are an important component of deer winter range. The action alternatives would have from 928 (Alternatives 2, 5, and 6) to 870 acres (Alternative 4) remaining in Old-growth Block B.

Table 4-54b shows the long-term cumulative effect on Sitka black-tailed deer of harvesting all operable acres, including State and private land, within the project area. The harvest of all operable acres will reduce the current deer habitat capability 20 to 42 percent of the 1990 capability (from 1,807 deer in 1990, down to 524 to 773 deer in 2060). This will reduce the deer population to a level where the amount of deer available for harvest will not meet the demand. This is the worst case analysis.

Effects of Timber Harvest on Deer Hunting

Human use of wildlife resources will be affected by timber harvest activities. On one hand, timber related employment under the action alternatives will increase the number of hunters and the demand for deer over the no action alternative. Road systems built to access timber will provide vehicle access into areas and will also increase the demand for deer. On the other hand, timber harvest will cause the habitat capability for deer to decline. Additionally, roads may increase the number of hunters and results in over-harvest. The road systems may increase hunter numbers to the point where there will not be enough deer to satisfy demand. Restrictions to seasons and bag limits may occur as a result of hunting pressure and Ketchikan hunters may be forced to hunt elsewhere.

Human Demand For Deer

The deer hunter demand level for a particular area and time is hard to project, since hunter use is very dynamic. Hunter use varies with: 1) deer populations, 2) hunter familiarity of the area, and 3) hunter traditions. The Alaska Department of Fish and Game has designed a process to establish population objectives for deer based on human demand. The process is in its early stages and has not yielded estimates of desired harvest levels.

Effect of Forest Management On Adjacent Private Property On Deer and Hunters

Sections of the project area are bordered by large tracts of private land. These lands are owned by Native Corporations and have received extensive timber harvest operations. Due to the large size of clearcuts and fast rate of timber harvest on these lands, deer populations are expected to substantially decline over the next two decades. Consequently, lower deer density on private lands will increase demand for deer hunting opportunities on adjacent National Forest lands.

Assuming that most of the remaining State and private timber will be removed within the next 10-year period, there will be a reduction in the amount of high volume old-growth habitats. In the future, as clearcuts mature, there will be a reduction in understory biomass (Alaback 1984). The combination of the following factors: (a) reduction of forage; (b) loss of high value winter habitat; and (c) poor juxtaposition of habitats will cause habitat capability to decline in the long term. Within 25 years, the mean winter habitat capability

is predicted to decline by about 50 percent on private lands. As the clearcuts age and become less suitable for deer, hunters will move onto the National Forest and slightly increase the demand for deer.

Essentially all old growth will be removed from State and private lands. Deer populations will decline on these private lands to a point that the hunting pressure will move onto adjacent National Forest lands, thereby increasing hunting pressure on the National Forest. This may lead to reduced hunter success and may lead to more restrictive deer bag limits.

Pine Marten

Pine marten primarily require upland old-growth stands for critical stages of their life cycle. They were selected as a Management Indicator Species to represent old-growth dependent species and because they are important furbearers.

Pine marten habitat was calculated as acres of volume class 4–7 below 1,500 feet in elevation. Habitat is fully effective when stands are over 180 acres each and the old-growth stands are interconnected into tracts larger than 16,000 acres.

This section deals with the effects of timber harvest on pine marten habitat, with respect to short-term effects and cumulative effects.

Effects of Timber Harvest

Pine marten prefer habitat with old-growth characteristics. Timber harvest of old-growth habitats reduces pine marten habitat capability. Very little is known of the pine marten's specific habitat requirements in southeast Alaska. However, numerous studies in other locales have shown clearcutting to be detrimental to pine marten populations (Suring et al. 1988a). Clearcutting results in elimination of resting sites, winter hunting sites, overhead cover, and preferred prey species (Campbell 1979). Pine marten avoid advanced second-growth stands, due to low prey densities and the absence of large snags. Pine marten habitat capability and populations decline faster than the amount of old-growth habitat harvested.

Roads through pine marten habitat increase opportunities for trappers to harvest this species. High pine marten populations are usually associated with locales having restricted human access, such as roadless areas or where trapping pressure is strictly regulated. Pine marten are easily trapped and their populations are expected to decline given current marten harvest regulations and possible expansion of the road network. It is difficult to vary harvest regulations for each small locale.

Increased access to pine marten habitat varies under each action alternative. Alternative 1 proposes no new road construction. Miles of road construction for the action alternatives are listed in order of least through the greatest miles of road, respectively: Alternative 5 (61 miles), Alternative 2 (51 miles), Alternative 3 (59 miles), Alternative 6 (71 miles), and Alternative 4 (79 miles). Because the proposed road system is considered an isolated road system, the anticipated effects of roading could be softened with mitigation measures (selective road closure and restricted access) following timber harvest (see mitigation measures and unit specific mitigation measures in Appendix B).

Short-Term Effects

Today (1990) there are 25,628 acres of pine marten habitat. The action alternatives schedule between 8 and 14 percent (2,164 to 3,593 acres) of pine marten habitat (Table 4–57).

Table 4–57
Pine Marten (Acres of Habitat)*

Volume Class	Alternative 1	2	3	4	5	6
4	10047	9688	9446	8915	9172	9058
5	14018	12564	12583	11844	12357	12216
6	1234	938	1133	948	1200	1015
7	329	274	245	328	329	289
Total	25628	23464	23407	22035	23058	22578

*Acres of habitat below alpine.

The habitat capabilities for pine marten were calculated by using the acres of habitat (volume class 4–7 less than 1,500 feet in elevation) times the mean density for pine marten as listed in the Model (Suring et al. 1988a). The block size effectiveness was also incorporated in the population estimate for this analysis. The habitat capability for 1990 (No Action Alternative) is 76 pine marten. The 1990 action alternatives present habitat capabilities ranging between 84 and 51 percent (64 to 39 marten) of the present capability (Table 4–54).

Cumulative Effects
An important way of analyzing cumulative effects on pine marten is to consider the area of old-growth prescription which would remain at the end of rotation. The amount of designated old-growth prescription that would remain at the end of rotation varies per alternative. The old-growth blocks have been prioritized for pine marten (Table 4–50) and acres remaining in each block are listed (Table 4–51) by alternative. Old-growth Blocks E and C are listed as having the highest priority for pine marten. The action alternatives would have from 388 (Alternative 4) to 37 (Alternative 2) acres remaining in Old-growth Block E. The action alternatives would have from 924 (Alternative 5) to zero (Alternative 4) acres remaining in Effective Block C.

Table 4–54b shows the long-term cumulative effect on pine marten of harvesting all operable acres within the project area. The drastic reduction in marten numbers is a result of habitat loss and the effect of increased road densities. At this low population density, marten will probably be eliminated from the project area, except in Alternative 5.

Black Bear
Black bear were selected as an MIS to represent estuarine habitat and diversity. The black bear is also an important game species. Black bear occur throughout the study area and populations are currently stable (B. Woods Pers. Comm.).

Black bear habitat was calculated as acres of estuary, beach, lakeside and anadromous streamside.

This section deals with the effects of timber harvest on black bear habitat with respect to short-term effects and cumulative effects.

Effects of Timber Harvest
Clearcutting within black bear habitat removes security cover and den sites, thereby reducing habitat capability. Clearcutting within foraging habitat creates highly productive foraging sites and increases habitat capability for about 25 years following timber harvest. After 25 years the conifer canopy closes and forage production declines. Clearcutting reduces the number of future den trees within foraging habitats.

The effects of this level of harvest on black bear habitat capability depend largely upon the timing, spacing, placement, and size of timber harvest units. Black bear habitat capability would likely be maintained to the year 2060, if the future harvest is planned to: (1) provide a continual supply of recent clearcuts throughout time, (2) minimize the amount of black bear habitat in unproductive older second-growth stands at any time, and (3) intersperse the second-growth stands with stands of old growth to provide den sites and security cover adjacent to important riparian and estuarine feeding areas under all alternatives.

Much of the critical black bear habitat will be retained. The AHMU standards and guidelines will maintain security cover and travel corridors for stream fishing black bears. Important general foraging habitats for black bears are in the lower volume stands. Higher volume stands tend to contain less black bear food. A positive impact on black bears is expected for the short term, due to the additional forage found in clearcuts (from 0–25 years of age). Den trees are not considered to be a limiting factor in the short term.

Road construction and increased human activity will increase the harvest opportunities and demand for black bear. Road construction associated with each alternative would increase hunter access to black bear habitats. The increased human activity and access will increase black bear mortality due to legal harvest, illegal harvest, and removal of nuisance bears. The increases in access and hunter harvest would be greatest under those alternatives with the most extensive roading. Alternative 4 constructs the largest amount of road followed by Alternatives 6, 5,3, and 2. The increased harvest may depress local black bear populations.

Effects of garbage dumps in association with logging camps and rural communities have been identified as a cause for increased bear mortality. The Forest Service participated in drafting a joint policy (see 1989–94 KPC FEIS—Appendix Q) statement in 1987 with Alaska Department of Environmental Conservation and Alaska Department of Fish and Game.

The Forest Service will ensure, through administration of special use permits, that compliance with the intent of the joint policy statement is met. The Forest Service will continue to cooperate and work with the respective State agencies to resolve problems with habituation of the black bears to humans through garbage dumps.

Short-Term Effects

In 1990 there would be 2,263 acres of habitat in Alternative 1. The action alternatives schedule between 1 and 4 percent (12 to 101 acres) of critical black bear habitat (Table 4–58).

Table 4–58
Black Bear (Acres of Critical Habitat)*

	Alternative					
Habitat	*1*	*2*	*3*	*4*	*5*	*6*
Anadromous Stream	1143	1121	1133	1117	1121	1122
Lakeside	143	143	143	143	143	143
Beach	885	885	883	828	885	885
Estuary	92	92	92	74	92	92
Total	2263	2241	2251	2162	2241	2242

*Habitat capability numbers in Tables 4–54a and 4–54b also include non-riparian upland acres.

The habitat capability for black bear was calculated on the previously mentioned habitat by multiplying the habitat by the optimum habitat density figure listed in the model (Suring et al. 1988c). The habitat capability for 1990 (no action alternative) is 7 black bear. The 1994 action alternatives present habitat capability ranging between 100 and 86 percent (7 to 6 black bear) of the present population (Table 4–54a).

Cumulative Effects

An important way of analyzing cumulative effects on black bear is to consider the area of old-growth prescription which would remain at the end of rotation. The amount of designated old-growth prescription that would remain at the end of rotation varies per alternative. Beach fringe is an important part of black bear habitat and it has been proposed for old-growth prescription as Old-growth Block B (Table 4–50). The action alternatives would have from 928 (Alternatives 2, 5, and 6) to 870 (Alternative 4) acres remaining in Old-growth Block B (Table 4–51).

Bald Eagle

Bald eagles were selected as an MIS because the public has a strong interest in the species and because the species has special habitat requirements. The bald eagle and its habitat have been given special protection through the Memorandum of Understanding and the Bald Eagle Protection Act.

Bald eagle habitat was calculated as acres of beach fringe and anadromous streamside.

This section deals with the effects of timber harvest on bald eagle habitat with respect to short-term effects and cumulative effects.

Effects of Timber Harvest

Bald eagles prefer large diameter old-growth trees for nest and perch sites. Typical nest trees are at least 400 to 500 years old (Hodges 1982). Removal of perch or nest trees reduces habitat capability. Approximately 50 percent of bald eagle nests are lost to wind related events per 13 year period. Therefore, long-term management of bald eagle habitat requires that alternate nest and perch sites be retained (Suring et al. 1988d). It was determined during the formulation of alternatives and selection of harvest units that one nest would potentially be affected. All harvest units with bald eagle nest concerns will have boundaries moved to provide a protective buffer around the nest tree in accord with the Memorandum of Understanding (MOU) between the Forest Service and the Fish and Wildlife Service.

Both bald eagle nesting habitats and seasonal concentration areas are vulnerable to disturbance. Whether a given event is significant or not, depends upon the severity of the disturbance and the response of the bald eagle involved. Because bald eagles vary considerably in their response to human activity, it is difficult to predict the effects of a given type of human disturbance on individual eagles (Stalmaster et al. 1985).

The majority of coastal southeast Alaska is without permanent human habitation and residential or commercial developments. Most potential disturbances to bald eagles are associated with road construction, timber harvest, and recreational use of National Forest lands and surrounding waters. Specific activities that bald eagles may be exposed to include: (a) boat traffic, (b) car traffic, (c) low-flying airplanes and helicopters, (d) foot traffic, (e) truck and other heavy equipment traffic, (f) surface and subsurface blasting, (g) firearm discharge, and (h) logging. In general these activities, except logging and frequent use of certain roadways, create sporadic rather than prolonged disturbance.

Under various roading options proposed by the alternatives, there are between 0 and 6 nests within ½ mile of proposed roads. These nests will be vulnerable to human disturbance from construction and traffic. The MOU between Fish and Wildlife Service and Forest Service will continue to be implemented.

The proposed units have been designed to avoid bald eagle nest sites and their buffers in all alternatives. The old-growth forest in the beach fringe, a primary component of the bald eagle habitat, has been proposed for old-growth prescription. The placement of beach fringe in old-growth prescription will allow for the recruitment of future nest sites and perch trees for bald eagles.

Short-Term Effects

In 1990 there would be 2,028 acres of habitat in Alternative 1. Action alternatives schedule between 1 and 4 percent (12 and 83 acres) of bald eagle habitat (Table 4-59).

Table 4-59
Bald Eagle (Acres of Habitat)

	Alternative					
Habitat	*1*	*2*	*3*	*4*	*5*	*6*
Anadromous Stream	1143	1121	1133	1117	1121	1122
Beach	885	885	883	828	885	885
Total	2028	2006	2016	1945	2006	2007

The habitat capability for bald eagles was calculated by using the acres of habitat (anadromous streamside and beach fringe) multiplied by the factors listed in the Bald Eagle Model (Suring 1988d). The habitat capability for 1990 (No Action Alternative) is 73 bald eagles. The 1990 action alternatives provide habitat capability ranging between 100 and 96 percent (73 and 70 bald eagles) of the present population (Table 4-60).

Table 4-60
Bald Eagle Habitat Capability (Number of Birds)

	Alternative					
Habitat	*1*	*2*	*3*	*4*	*5*	*6*
Anadromous Stream	38	37	37	37	37	37
Beach	36	36	36	34	36	36
Total	74	73	73	71	73	73

Cumulative Effects

An important way of analyzing cumulative effects on bald eagles is to consider the area of old-growth prescription which would remain at the end of rotation. The amount of designated old-growth prescription that would remain at the end of rotation varies per alternative. The Old-growth Blocks have been prioritized for bald eagles (Table 4-50) and acres remaining in each block are listed (Table 4-51) by alternative. Old-growth Block B (beach fringe) has the highest priority for bald eagles. The action alternatives would have from 928 (Alternatives 2, 5, and 6) to 870 (Alternative 4) acres remaining in Old-growth Block B.

River Otter

The river otter was selected as an MIS to represent riparian habitats and because it is an important furbearer. River otter generally occur in close proximity to anadromous streams, lakes and beach fringe habitats. River otter habitat was calculated as acres of the previously mentioned habitats. Because of the difficulty of analysis, natal denning habitat was not calculated for the project area.

This section deals with the effects of timber harvest on river otter habitat with respect to short-term effects and cumulative effects.

Effects of Timber Harvest

The initial entry into the project area occurred during the 1960s. Beach fringe harvesting and the construction of the Swan Lake Power Line comprise the majority of the 1,300 acres harvested. River otters did not utilize beaches with preferred foraging characteristics when these areas were adjacent to clearcuts (Larsen 1983). Five to twenty year old clearcuts were used less than expected by river otters while forested habitats were used in proportion to availability. It is anticipated that the beach fringe portion of the river otter habitat, which was harvested in the 1960s, is no longer utilized and has been removed from the river otter habitat in this analysis.

Roads through river otter habitats will increase opportunities to harvest river otters, and may also require increased harvest regulations if fur prices rise. A discussion of the relative amount of access created by each alternative is listed in the pine marten section. Where no roads exist there would be less potential for increased harvest or overharvest of river otters. The proposed road system is considered an isolated road system and will not present much trapping pressure.

Short-Term Effects

Today (1990) there are 2,171 acres of suitable river otter habitat. The action alternatives schedule between 1 and 4 percent (12 to 83 acres) of river otter habitat (Table 4-61).

Table 4-61
River Otter (Acres of Habitat)

	Alternative					
Habitat	*1*	*2*	*3*	*4*	*5*	*6*
Anadromous Stream	1143	1121	1133	1117	1121	1122
Lakeside	143	143	143	143	143	143
Beach	885	885	883	828	885	885
Total	2171	2149	2159	2088	2149	2150

Habitat capability for river otter was calculated by using the acres of habitat multiplied by the density of river otter listed in the model (Suring et al. 1988e). The habitat capability for 1990 (No Action Alternative) is 11 river otter (Table 4-62). The habitat capability for the action alternatives is equal to the present population. A large portion of the river otter habitat has been protected in the fisheries AHMU buffers and in the beach fringe old-growth prescription. Unit layout could result in the logging of river otter denning habitat.

Table 4-62
River Otter Habitat Capability (Number of Animals)

	Alternative					
Habitat	*1*	*2*	*3*	*4*	*5*	*6*
Anadromous Stream	3	3	3	3	3	3
Lakeside	0	0	0	0	0	0
Beach	8	8	8	8	8	8
Total	11	11	11	11	11	11

Cumulative Effects

An important way of analyzing cumulative effects on river otter is to consider the area of old-growth prescription which would remain at the end of rotation. The amount of

designated old-growth prescription that would remain at the end of rotation varies per alternative (see Table 4-51). Beach Fringe is an important part of river otter habitat and it has been proposed for old-growth prescription as Old-growth Block B (Table 4-50). The action alternatives would have from 928 (Alternatives 2, 5, and 6) to 870 (Alternative 4) acres remaining in Old-growth Block B (Table 4-51).

Hairy Woodpecker

The hairy woodpecker was selected as an MIS because of its preference for stands of old-growth western hemlock and Sitka spruce and for its association with snags. As a primary excavator, it provides potential nesting cavities, dens, and roosting sites for several secondary cavity nesting species. Hairy woodpeckers require a continual recruitment of snags into the habitat (Menasco 1983; and Goodwin 1983).

Hairy woodpecker habitat was calculated as acres of operable volume classes 4–7 below subalpine with full block size effectiveness reached at 500 acres.

This section deals with the effects of timber harvest on hairy woodpecker habitat with respect to short-term effects and cumulative effects.

Effects of Timber Harvest

Hairy woodpeckers require large diameter trees in various stages of decay. Woodpecker densities are assumed to be directly related to snag densities. Current timber harvest activities remove all commercial timber down to 8 inch tops, resulting in a decline in snag densities. Snags within a harvest unit are felled for safety reasons. Hairy woodpecker habitat capability is expected to decline proportionately to the reduction of snag density. The timber harvest eliminates future woodpecker nesting and roosting sites and reduces future use by secondary cavity users. The snag policy (Chapter 2, Standards and Guidelines, and Mitigation Measures) is an important mitigation measure to reduce the impacts of harvest on the hairy woodpecker habitat and population.

The effects of roads on the hairy woodpecker habitat should be insignificant, except for areas near communities where snags are cut for firewood. Firewood cutting along roads in Shelter Cove will not occur because this is an isolated road system.

Short-Term Effects

Today (1990) there are 22,269 acres of hairy woodpecker habitat. The action alternatives schedule between 9 and 16 percent (2,050 to 3,502 acres) of hairy woodpecker habitat (Table 4-63).

Table 4-63
Hairy Woodpecker (Acres of Habitat)*

	Alternative					
Volume Class	*1*	*2*	*3*	*4*	*5*	*6*
4	13242	12897	12669	12117	12381	12286
5	14525	13154	13195	12419	12957	12784
6	1225	943	1128	955	1191	1015
7	380	328	315	279	380	340
Total	29372	27322	27307	25870	26909	26425

*Acres of habitat below subalpine.

Habitat capabilities for hairy woodpeckers were calculated by using the acres of habitat (operable volume classes 4–7 below subalpine) multiplied by the winter density per volume class as listed in the model (Suring et al. 1988f) block size effectiveness of 500 acres. The

habitat capability for 1990 (No Action Alternative) is 342 hairy woodpeckers. The action alternatives present habitat capabilities ranging between 85 and 60 percent (292 to 205 birds) of the present population (Table 4-64).

Table 4-64
Hairy Woodpecker Habitat Capability (Number of Birds) In the Year 2000

	Alternative					
Volume Class	*1*	*2*	*3*	*4*	*5*	*6*
4	124	121	119	114	116	115
5	431	391	392	369	385	380
6	61	47	56	48	60	51
7	19	16	16	19	19	17
Total	635	575	583	550	580	563
Block Size Effectiveness	464	288	344	303	406	298

* CFL timber below subalpine.

Cumulative Effects
An important way of analyzing cumulative effects on hairy woodpeckers is to consider the area of old-growth prescription which would remain at the end of rotation. The amount of designated old-growth prescription that would remain at the end of rotation varies per alternative. The total acres of wildlife old-growth prescription would be a method of estimating the cumulative effects on hairy woodpeckers (Table 4-51). The action alternatives would have from 5,805 (Alternative 5) to 2,566 (Alternative 2) acres remaining in old-growth blocks.

The implementation of the snag policy (listed in the Mitigation Measures of Chapter 2) will not provide a mitigation for the population reduction, because the standard provides little emphasis on snag dispersal.

Vancouver Canada Goose
The Vancouver Canada goose was chosen as an MIS to represent old-growth forest near muskeg and riparian habitat. The Vancouver Canada goose is also a game species.

Vancouver Canada goose habitat was calculated as acres of anadromous streamside, lakeside and estuary (Table 4-65). The acres of Vancouver Canada goose habitat in muskegs were not incorporated into this analysis.

This section deals with the effects of timber harvest on Vancouver Canada goose habitat with respect to short-term effects and cumulative effects.

Effects of Timber Harvest
Vancouver Canada geese are a unique race of Canada geese, in that they use forest habitat for nesting and brood rearing (Lebeda and Ratti 1983). Lebeda (1980) reported that these geese made use of both noncommercial forest land and low volume commercial forest land. Management activities in inland wetland, estuarine and forested habitats could affect these geese. Implementation of the muskeg buffer (see Mitigation Measures, Chapter 2) mitigation measure will provide protection for the Vancouver Canada goose's important feeding and brood rearing habitat.

Much of the streamside and beach habitat would be retained due to the implementation of the stream (AHMU prescription) and eagle habitat protection measures (see Standards and Guidelines Chapter 2 and Unit Specific Mitigation).

Roads through Vancouver Canada goose habitat will increase opportunities for human disturbance during nesting and migration. Roads near estuarine and beach Vancouver Canada goose habitats create opportunities for hunters during fall migration.

Short-Term Effects

Today (1990), there are 1,378 acres of Vancouver Canada goose habitat. The action alternatives schedule between 1 and 3 percent (10 to 44 acres) of goose habitat (Table 4–65).

Table 4–65

Vancouver Canada Goose (Acres of Habitat)

	Alternative					
Habitat	*1*	*2*	*3*	*4*	*5*	*6*
Anadromous Stream	1143	1121	1133	1117	1121	1122
Lakeside	143	143	143	143	143	143
Estuary	92	92	92	74	92	92
Total	1378	1356	1368	1334	1356	1357

No habitat capabilities were calculated for the Vancouver Canada goose.

Cumulative Effects

An important way of analyzing cumulative effects on Vancouver Canada geese is to consider the area of old-growth prescription which would remain at the end of rotation. The amount of designated old-growth prescription that would remain at the end of rotation varies per alternative. The total acres of wildlife old-growth prescription would be a method of estimating the cumulative effects on Vancouver Canada geese (Table 4–51). The action alternatives would have from 5,805 (Alternative 5) to 2,566 (Alternative 2) acres remaining in wildlife old-growth effective block prescription.

Northern Goshawk

The Northern Goshawk was not selected as an MIS during the development of this document, although it is a national Resource Planning Act (RPA) MIS and was recommended by many biologists as a prime indicator of old growth for the Alaska Region (Suring and Sidle 1987). For this reason the northern goshawk is included in our discussion of environmental effects. Goshawks forage over 5,000 to 8,000 acres. In the opinion of Forest Service wildlife biologists, the only suitable foraging range for a breeding pair in the Shelter Cove project area lies in and near the recommended old-growth block from Saddle Lakes to the Naha LUD II. In addition to being large, the recommended old-growth block connects to other suitable goshawk habitat within the Naha LUD II. The result is about 20,000 acres of interconnected old growth. Alternative 5 would retain this habitat characteristic.

ANILCA Section 810 Subsistence Evaluation and Finding

Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) Requires a Federal agency, having jurisdiction over lands in Alaska, to evaluate the potential effects of proposed land-use activities on subsistence uses and needs. Section 810 of ANILCA states;

In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands under and provision of law authorizing such actions, the head of the agency having primary disposition over such lands or his designee shall evaluate the effect of such use, occupancy, or disposition on subsistence uses and needs,

the availability of other lands for purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such federal agency:

A. Gives notice to the appropriate state agency and appropriate local committees and regional councils established pursuant to ANILCA Section 805;

B. Gives notice of, and holds, a hearing in the vicinity of the area involved; and

C. Determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands; (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such action.

In Hanlon v. Barton, the Federal District Court concluded that the Forest Service must consider the cumulative impacts to subsistence resources and subsistence users of past, proposed, and reasonably foreseeable future activities in conducting an ANILCA Section 810 Subsistence Evaluation. Further, the Court noted that actions need not be connected to be considered as cumulative effects.

This section evaluates how the proposed action alternatives could affect subsistence resources used by residents of Metlakatla and Saxman. The subsistence resource categories evaluated are wildlife, fish, timber, and other foods such as berries and kelp. Effects of the proposed alternatives are evaluated by: (1) changes in abundance or distribution of subsistence resources, (2) changes in access to subsistence resources, and (3) changes in competition from non-subsistence users for those resources. The evaluation determines whether subsistence uses in the George and Carroll Inlet area would be significantly restricted by any of the proposed action alternatives. To determine this, the evaluation: (1) considers the availability of subsistence resources in the surrounding areas; (2) considers the cumulative impacts of past and foreseeable future activities on subsistence users and resources; (3) looks at potential cultural and socioeconomic implications affecting subsistence users; and (4) focuses on important subsistence-use areas in the George and Carroll Inlet area.

The evaluation relies on the use of wildlife habitat capability models, ADF&G hunter survey data, and the 1987 Tongass Resource Use Cooperative Study.

Based on the Federal District Court's finding in Hanlon v. Barton, Subsistence Hearings were scheduled.

Subsistence Hearings

The hearings and open house announcements were published in the Island Newspaper, the Ketchikan Daily News, and the Wrangell Sentinel. Posters were displayed in the Metlakatla Community Center, the Thorne Bay Community Center, and the Wrangell Post Office. Announcement letters were included in the water bill for Saxman residents. Notices for the hearings were also announced on the cable TV for Metlakatla and local community radio stations.

Open House and Public Hearings for subsistence testimony regarding the Shelter Cove Draft Environmental Impact Statement and ANILCA section 810 Subsistence evaluations

were held at the places and dates listed below:

Community	*Date*	*Location*
Thorne Bay	Jan. 14, 1991	City Council Chambers
Thorne Bay	Jan. 24, 1991	City Council Chambers
Saxman	Jan. 15, 1991	Saxman City Hall
Saxman	Dec. 7, 1989	Saxman City Hall
Metlakatla	Jan. 16, 1991	City Council Chambers
Metlakatla	Dec. 12, 1989	City Council Chambers
Wrangell	Jan. 17, 1991	USFS District Office

Attendance of these hearings was very poor, only two people gave testimony at the hearing held at Saxman, and three people gave testimony at Wrangell. No other written testimony was received as a results of the subsistence hearings.

Both testimonies given at Saxman indicated that roads resulting from timber harvest will improve subsistence gathering opportunities, Thomas Abbott said "If we have roads as shown there on Alternative 4, we have better access to getting our subsistence." Forrest DeWitt, the mayor of Saxman, wanted to see fish streams protected, and said "in looking at some of the areas of buffer zones, it looks pretty good to us."

Findings

Using the information gathered from the hearings and written public comments, the FEIS subsistence evaluation considers, with distinct findings by alternative and by resource category, whether or not there is a significant possibility of a significant restriction of subsistence use. Again, the resource categories evaluated are fish, wildlife, other foods, and timber. The evaluation considers the effects by alternative on (1) abundance or distribution, (2) access, (3) and competition for each resource category.

The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in the findings. By this definition:

> A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses generally are caused by: reductions in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by non-rural residents. The responsible line officer must be sensitive to localized, individual restrictions created by any action and make his/her decision after a reasonable analysis of the information available.

The U.S. District Court Decision of Record in Kunaknana v. Watt provided additional definitions of "significant restriction of subsistence uses" and are also used as guidelines in the findings. The definitions from Kunaknana v. Watt are:

Significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken shall have no or slight effect as opposed to large or substantial effects. In further explanation the Director (BLM) states that no significant restriction results when there would be "no or slight" reduction in the abundance of harvestable resources and no occasional redistribution of these resources. There would be no effect (slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting sites; and there would be no substantial increase in competition for harvestable resources (that is, no substantial increase in hunting by non-rural residents).

Conversely, restrictions for subsistence uses would be significant if there were large reductions in abundance or major redistribution of these resources, substantial interference with harvestable access to active subsistence-use sites or major increases in . . . non-rural resident hunting.

In light of this definition the determination (finding) of significant restriction must be made on a reasonable basis, since it must be decided in light of the total subsistence lands and resources that are available to individuals in surrounding areas living a subsistence lifestyle.

Other Lands and Other Alternatives

Initially, the FEIS was to have been conducted on Management Areas K32 Through K40, which are the non-wilderness portions of Revillagigedo Island (Revilla Island). The intent was to meet the public's demand for multiple use throughout Revilla Island. This objective was to have been accomplished by integrating timber sales and their associated road systems. As the project progressed, funding constraints, Native Selections, Tongass Land Management Revision, preparation of the EIS for 1989–94 operating period for the KPC contract and land exchanges contributed to reducing the size of the project area. To meet the independent sale program, the portion of Revilla Island west of Carroll Inlet and east of the State lands (around Leask Lakes) became the focus of the project. The independent sale program must be outside the Long Term Sale contract boundary. This contributed to the reducion in size of the area. The preferred log transfer facility is located at Shelter Cove, from which the project received its name.

Wildlife Findings

The rural communities in the vicinity of George and Carroll Inlet, primarily Saxman, and Metlakatla, harvest a variety of wildlife resources. The 1987 Tongass Resource Use Co-operative Study found that the average pounds of edible subsistence resources harvested per capita in 1987 was 71 and 90 for Metlakatla and Saxman, respectively. These harvest levels are are some of the lowest in southeast Alaska,particularly when compared to the harvest levels of communities such as Edna Bay and Meyers Chuck, which was 517 and 414 pounds, respectively. This would indicate that subsistence gathering is not as pronounced as in other communities. It is assumed that this lower level of subsistence harvest is related to the close proximity of Ketchikan and the easier availability of food at grocery stores.

Table 4-66, taken from the TRUCS report, examines the relative role of subsistence in communities which would be affected by the proposed project, primarily Metlakatla and Saxman.

Table 4-66
Per Capita Harvest in Pounds of Principal Resources by Community

Resource	Thorne Bay	Metlakatla	Saxman
Deer	36.70	10.64	16.69
Salmon	47.87	20.30	33.29
Other Finfish	74.20	16.33	17.66
Shellfish	18.50	16.19	10.22
Plants	2.63	4.31	3.26
Birds	1.82	1.95	0.07
Other Mammals	5.90	1.10	7.71
Total	187.70	70.81	89.53

Table 4-67, taken from the TRUCS report, displays the relative importance of key sub-sistence groups within households by community based on mean edible pounds per household.

Table 4-67
Relative Importance of Key Subsistence Activities by Household and Community (Percent)

	Subsistence Group Harvest as Percent of Total Household Subsistence Harvest					
Community	*Deer*	*Black Bear*	*Salmon*	*Other Finfish*	*Shellfish*	*Other*
Metlakatla	16.2	0	32.6	29.0	14.1	4.8
Saxman	19.0	0	38.4	20.4	11.9	10.3
Thorne Bay	20.0	3	25.0	40.0	10.0	2.0

The majority of the project area is not roaded. The roaded areas are located in the vicinity of Brown Mountain, the White River drainage and Cape Fox's LTF at Coon Cove. Access is limited due to road closures on private land. As a result, subsistence access is primarily by water and areas of importance are located at low elevation near saltwater. As part of the TRUCS report, interviews within the communities of Saxman and Metlakatla indicated that subsistence use is limited to the saltwater beach fringe within the project area. The State of Alaska ADF&G, Division of Subsistence has also developed a series of maps, delineating important subsistence gathering areas by community. These maps also indicated that the narrow beach fringe along saltwater in George and Carroll inlets, were used for subsistence gathering activities. The preceding information leads to the conclusion that the old-growth beach fringe is an area of concentrated subsistence use.

The project area contains about 19,285 acres of operable timber, 885 acres of which are old-growth beach fringe. Table 4-68 displays the amount of timber scheduled for harvest within this area of concentrated subsistence use.

Table 4-68
Timber Scheduled for Harvest in Areas of Concentrated Subsistence Use (Acres)

Alternative	Acres Scheduled
1	0
2	0
3	2
4	57
5	0
6	0

Abundance and Distribution

Sitka Black-tailed Deer

Deer are an important subsistence resource used by the rural communities in southeast Alaska. The Tongass Resource Use Cooperative Study indicated that deer made up 16 to 19 percent of the per-capita harvest of principal subsistence resources by subsistence users in Metlakatla and Saxman. The per-capita harvest of deer was 10.64 pounds by Metlakatla residents and 16.69 pounds by Saxman residents.

Table 4-69

Reported Legal Deer Harvest in Minor Harvest Areas 406 and 407, 1987-90

Year	Number of Hunter Days	Number of Deer Harvested
1987	440	148
1988	478	209
1989	365	83

Source: ADF&G Hunter Surveys.

Based on the highest deer harvest during the past three years in Minor Harvest Units 406 and 407, the current demand for deer is 209 (harvest level for 1988). The deer harvest in 1988 from MHA 406, west of Carroll Inlet, and MHA 407 (roughly the project area) was estimated to be about 138 deer. This was determined in a discussion with Bob Woods, ADF&G Area Wildlife Biologist, by assuming the deer harvest in MHA 406, west of Carroll Inlet was 1/3 of the total for the whole MHA since it was roughly 1/3 of the area (34 deer); and the total deer harvest from MHA 407 (104). The 34 deer from MHA 406 and the 104 deer from MHA 407 would mean a total harvest of 138 deer from the project area.

The Alaska Department of Fish and Game has determined that 10 percent of a deer population can be safely harvested on an annual basis and still provide for a sustainable population. Using this 10 percent figure, a population of at least 2,090 deer is required to meet current demand in MHA 406 and 407, and 1,380 deer are needed to meet current demand in the project area.

Table 4-70 displays the number of deer the habitat in the project area is capable of supporting now and in the year 2000 by alternative. The habitat capability deer numbers are based on a model and are shown here primarily for the purpose of comparing alternatives. These deer numbers should not be interpreted as exact numbers, for in any given year populations may exceed habitat capability (e.g., due to mild winters) or be below what the habitat is capable of producing, due to predation, winter mortality, or other ecological factors.

Table 4-70

Deer Habitat Capability and Number of Deer Needed to Meet Demand for the Shelter Cove Project Area

	No. of Deer National Forest Habitat Can Support in Year		Population of Deer Needed to Meet Demand
Alternative	*1990*	*2000*	*1990*
1	1,807	1,807	1,380
2	1,807	1,408	1,380
3	1,807	1,523	1,380
4	1,807	1,280	1,380
5	1,807	1,567	1,380
6	1,807	1,400	1,380

Table 4-70 shows that the project area can meet current demand in the year 2000 after the project is implemented for all alternatives except Alternative 4. In reality, all alternatives probably meet demand, because only Forest Service controlled habitat was considered in Table 4-70. State and private lands account for 23,898 acres in the project area. These lands are capable of producing deer; however, the values for these lands were not counted

because their future conditions will not be known by the Forest Service since they are not in our jurisdiction.

The project area represents approximately 1/3 of the operable timber acres that exist in Minor Harvest Units 406 and 407. The project area contains 19,285 acres of operable timber. Minor Harvest Unit (Wildlife Analysis Area) 406 contains 42,822 acres of operable timber and 407 contains 17,229 acres of operable timber for a total of 60,051. Therefore, the habitat capability for Minor Harvest Areas 406 and 407 has roughly 3 times the habitat capability listed in Table 4-70 for the project area (approximately 5,400 deer with an allowable harvest of about 540 deer per year for MHA's 406 and 407).

Future demand for deer could double, even triple, and still be met within the boundary of Minor Harvest Units 406 and 407. Therefore, a significant possibility of a significant restriction of subsistence use of deer by rural residents is not anticipated.

The habitat capability listed for the year 2060 represents a worst case scenario, with all operable timber acres being harvested and regrown to age 25. The harvest of all operable acres will reduce the current deer habitat capability 20 to 42 percent of the 1990 habitat capability (from 1,807 deer in 1990, down to 524 to 773 deer in 2060). This will reduce the deer population to a level where the amount of deer available for harvest will not meet the demand.

Black Bear

Black bear are used for subsistence purposes throughout southeast Alaska, but use is minor. According to the TRUCS report (see Table 3-20) black bear was not harvested by Saxman or Metlakatla residents for subsistence use in 1987. In a 1990 report titled "Determining Customary and Traditional Uses of Selected populations of Moose, Goat, Black Bear, and Brown Bear," by ADF&G, Division of Subsistence, no bear were harvested in 1987 by residents of Metlakatla, Saxman or Ketchikan. Residents of Metlakatla harvested about 1 bear in 1984 and 1985. Residents of Ketchikan/Saxman (these communities were lumped together because Saxman does not have a Post Office and many Saxman residents have a Ketchikan mailing address) harvested about 71 bear in 1984 and 63 in 1985. Due to the small size of Saxman, it is assumed that most of the harvest was by Ketchikan residents and most of the harvest was sport hunting. Black bear harvest in the project area has ranged from 3 to 9 bear harvested per year during the years 1982-88 (see Table 3-25).

In 1990 there were 2,263 acres of identified critical black bear habitat existing within the project area (this includes anadromous stream, lakeside, beach, and estuary habitat). The action alternatives schedule between 1 and 4 percent (12 to 101 acres) of this critical habitat for harvest (Table 4-58). Based on the minor amount of critical black bear habitat scheduled for harvest and the limited subsistence use of black bear by residents of Metlakatla and Saxman, a significant possibility of a significant restriction in the subsistence use of black bear by local rural areas is not anticipated.

Furbearers

Furbearer harvest supplements the seasonal income of many southeast Alaska residents. According to the TRUCS report (see Table 3-20) furbearers were not harvested by Saxman or Metlakatla residents for subsistence use in 1987. None of the Alternatives are expected to cause a restriction of subsistence furbearer hunting in the short term to Saxman or Metlakatla residents.

With a better road system and improved access to areas not accessed before, there is a significant possibility that the local pine marten population may become overtrapped. However, harvest levels for pine marten and river otter (Tables 3-26 and 3-27) have been light for the past four seasons in the project area.

Since timber harvest is minimal in beach fringe areas or designated old-growth stands, there is not a significant possibility of a significant restriction of subsistence use of furbearer populations in the project area.

Waterfowl
Subsistence use of waterfowl by rural residents is principally associated with saltwater and fall migrations. Timber harvesting in beach fringe or estuarine area is minimal in all of the alternatives. Further, almost all timber harvest units in these habitats maintain a forested buffer between the beach or the estuarine area. Therefore, effects of timber harvest should be minimal.

Marine Mammals
Federal law prohibits the taking of marine mammals by anyone other than Native hunters. There is no evidence that timber harvest activities have had any effects on marine mammals. Therefore, there would be no possibility of a significant restriction in subsistence use of marine mammals by the rural communities surrounding the project area.

Access
Access to historic subsistence-use areas has not been affected by past land-use activities and will not be affected by any of the proposed alternatives. Nor is there a substantial chance it would be affected in the foreseeable future due to activities proposed in this project. This is because traditional access by boat to areas along the beaches would remain the same. The project road system will provide wildlife subsistence users a wider area from which to harvest some species of wildlife. However, without an interconnecting road system to Ketchikan, the use will be limited. In the future, if an interconnected road system is developed between the community of Ketchikan and the project area, wildlife subsistence users, particularly Saxman residents, would have a wider area from which to harvest some wildlife species.

Competition
Currently most of the deer in the project area and Minor Harvest Areas 406 and 407 are harvested by residents of Ketchikan, which is a non rural community as shown in Table 4-71. Some deer harvested by Ketchikan residents may have actually been Saxman residents. Due to the small population of Saxman, the number of Saxman residents listed as Ketchikan residents is not expected to be very many.

Table 4-71
Harvest of Deer in ADF&G Minor Harvest Areas 406 and 407 by Community, 1987-89

Minor Harvest Area & Community	1987	1988	1989
406			
Ketchikan	53	105	20
Wrangell	—	—	—
Revilla 406	6	—	—
Outside AK	—	—	5
Saxman	12	—	—
Shoal Cove	—	—	—
Swan Lake	—	—	—
407			
Juneau	—	—	—
Ketchikan	77	104	46
Other AK	—	—	—
Saxman	—	—	—
Swan Lake	—	—	—
Total	148	209	83

Table 4-72
Deer Harvest for ADF&G Minor Harvest Areas 406 and 407, 1987-89, by Rural vs. Non-rural Hunter

	Number of Deer Harvested			Percent Harvested	
Year	*Rural*	*Non-rural*	*Total*	*Rural*	*Non-rural*
1987	18	130	148	12	88
1988	—	209	209	0	100
1989	12	71	83	14	86

Table 4-73
Deer Harvest in Adjacent ADF&G Minor Harvest Areas by Community, 1987-89

Minor Harvest Area	Community	1987	1988	1989
405	Ketchikan	6	26	15
	Wrangell	—	—	0
	Revilla 406	6	—	—
	Total	12	26	15
404	Ketchikan	29	13	0
	Revilla 406	6	—	—
	Total	35	13	0
509	Juneau	0	—	—
	Ketchikan	66	59	55
	Loring	1	—	—
	Other AK	—	—	0
	Outside AK	—	0	—
	Total	67	59	55

Table 4-73 shows that deer harvest is light and spread out over a large area. One of the favorite places for area hunters to go is Prince of Wales Island, where the extensive road system can be utilized. While the data of past use of the project area indicates a low to moderate use, there could be a increase in short term competition from people associated with the timber harvest activity. However, these people could be locals who also qualify for subsistence use of the resource.

Finding

The preceding analysis leads to the conclusion that the actions proposed in Alternatives 1-6 do not present a significant possibility of a significant restriction of subsistence use of wildlife in the George and Carroll Inlets. That finding is based on the potential resource effects by the three evaluation categories shown in Table 4-74.

Table 4-74
Significant Possibility of a Significant Restriction of Subsistence Use of Wildlife Resources Around George and Carroll Inlets

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Abundance or Distribution	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

* "No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect.

Fish and Shellfish Findings

Fish and shellfish are an important subsistence resource used by the rural residents of Metlakatla and Saxman. The 1987 Tongass Resource Use Cooperative Study indicated fish are the largest single source of food for subsistence users, accounting for approximately 51 percent of the edible consumption on a regional basis. The TRUCS effort divided fish into two categories: (1) salmon, and (2) other finfish. The latter category consists primarily of saltwater species such as halibut and rockfish. The per capita harvest of salmon, other finfish and shellfish was 51 and 53 pounds for the communities of Saxman and Metlakatla.

Abundance and Distribution

Salmon

Salmon are a major subsistence food harvested by rural residents of Saxman and Metlakatla. The per-capita harvest of salmon was 20.3 pounds by Metlakatla residents, and 33.3 pounds by Saxman residents.

A major concern of hearing participants was that salmon habitat be protected. The fisheries section concludes that potential effects of the proposed timber harvest and road construction alternatives on salmon spawning and rearing habitat would be minimal or eliminated by applying the Forest Service standards, guidelines, and prescriptions, described in detail in the Aquatic Habitat Management Handbook (AHMU). All proposed timber harvest units near salmon streams (class I) and near resident streams (class II) flowing into salmon streams are protected by buffers of at least 100 feet. Specific AHMU prescriptions are in Appendix B for the proposed cutting units near or within the AHMU boundaries.

Based on the implementation of these site-specific prescriptions for protecting salmon habitat, it is projected that the immediate and foreseeable effects on the abundance and distribution of salmon for subsistence uses on and around George and Carroll Inlets would not be measurable.

Other Finfish

The action alternatives for the proposed project would have no immediate or foreseeable impact on other finfish habitat. Since there would be no impact on other finfish habitat, the abundance and distribution of those other finfish would not be affected.

Shellfish

At the hearings no one expressed their views about impacts to shellfish. The potential effects of proposed timber harvest, road construction, and log transfer facility use on habitat for crabs, clams, and other shellfish would be small (see Chapter 4 Transportation). The potential deleterious effects from operating the log transfer facilities will be incre-

mental additions to existing bark deposits. This operation would result in small effects to benthic organisms. Based on this, the effect on the abundance and distribution of local crabs, clams, and other shellfish would not be measurable. The project effects for the foreseeable future would also not be measurable.

Access

Access to historic subsistence-use fishing areas has not been affected by past land-use activities and would not be affected by any of the proposed alternatives. Nor is there a significant possibility it would be affected in the foreseeable future due to activities proposed in this project. This is because traditional access by boat would remain the same. Although additional roading would provide access to reaches of streams that were not previously used for harvesting subsistence salmon, the Forest Service is not aware of any residents from surrounding rural communities who are currently utilizing these reaches of salmon streams in the analysis area to harvest salmon.

The effect on access to salmon and other finfish harvest areas on National Forest lands is not expected to be substantial. This is based on current information which suggests the roads in the analysis area are not used extensively to access salmon, other finfish and shellfish harvesting areas, because existing roads are on private property. There are also ample opportunities to harvest salmon, shellfish and other finfish in surrounding areas.

Competition

Although there is potential for competition for salmon between residents of Ketchikan, Saxman, Metlakatla, and logging camp residents, there is no evidence of conflicting use for those fish. None of the written comments or hearing testimony indicate salmon availability to subsistence users is being affected by sport harvest and non-rural harvest.

Under ANILCA those communities which were eligible for subsistence fisheries near the project area are the residents of Metlakatla and Saxman. Others will participate through personal use fishery regulations.

Because of eligibility determination and the protection measures provided in this document for streamside buffer zones, none of the alternatives are expected to cause a significant possibility of a significant restriction of subsistence use of fish and shellfish.

Finding

The analysis concludes that the actions proposed in Alternatives 1-6 do not present a significant possibility of a significant restriction of subsistence use of fish and shellfish in the George and Carroll Inlet areas. That finding is based on the potential resource effects by the three evaluation categories shown in Table 4-75.

Table 4-75

Significant Possibility of a Significant Restriction of Subsistence Use of Fish and Shellfish Resources Around George and Carroll Inlets

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Abundance or Distribution	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

* "No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect.

Other Foods Finding

Information and data from the Tongass Resource Use Cooperative Study (TRUCS) and the Subsistence Hearings have provided the Forest Service with additional information concerning the gathering of other foods by rural communities. Other foods include plants such as kelp, goose tongue, and a variety of berries. Though other foods did not constitute a major portion of the 1987 subsistence harvest by the rural communities documented in TRUCS, they are considered subsistence resources. The TRUCS indicated plants made up 4-9 percent of the per-capita harvest of principal subsistence resources harvested by subsistence users of Metlakatla and Saxman. The pounds per capita were 4.3, and 3.3 for residents of Metlakatla and Saxman, respectively.

Access

Access to traditional other food gathering areas has not been affected by past land-use activities and will not be affected by any of the proposed alternatives. Nor is there significant possibility it would be affected in the foreseeable future due to activities proposed in this project. This is because traditional access by boat would remain the same.

Proposed road construction will provide another means of access to much of the area. These roads access areas which were not traditionally used for other food gathering. Opportunities to gather vegetation, e.g., berry picking, would be improved in the short term, actions proposed in any of the action alternatives would tremendously increase understory biomass after timber harvest. In the long term, as clearcuts are restocked and the canopy closes, forage drops by over 95 percent. Increased access would offer advantages for gathering vegetation. Therefore, the actions proposed with any of the alternatives would not have a significant possibility of a significant restriction of subsistence use of other foods.

Competition

No concern about competition for other foods was expressed at the subsistence hearings or in the written comments received on the proposed project.

There may be some increased competition for subsistence other food resources from rural residents, Alaska nonresidents, and non-rural residents employed at the logging camps. The increase in competition from non-rural residents and Alaska nonresidents, however, would not be substantial due to the availability of other food gathering sites on and around the project area.

Finding

The analysis concludes that the actions proposed in Alternatives 1-6 do not present a significant possibility of a significant restriction of subsistence use of other food resources on and around the project area. That finding is based on the potential resource effects by the three evaluation categories shown in Table 4-76.

Table 4-76

Significant Possibility of a Significant Restriction of Subsistence Use of Other Food Resources Around George and Carroll Inlets

	Alternative					
	1	*2*	*3*	*4*	*5*	*6*
Abundance or Distribution	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

* "No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect.

Timber Finding

Timber

Forest Service personal free-use policies in Alaska for firewood and timber would continue with all alternatives. The alternatives would range from no effect to improved access to timber for subsistence opportunities.

Mitigation

Because most subsistence use involves the harvesting of fish and game, mitigation measures that protect or enhance fish and game resources will also protect and enhance subsistence activities. Mitigation measures are built into each of the action alternatives considered in this analysis. These specific measures are detailed in Appendix B and are briefly summarized here.

Fish habitat is protected in each alternative through the application of AHMU prescriptions along every Class I and II stream and along some Class III streams. AHMU prescriptions, in addition to protecting fish habitat, also protect riparian habitat important to other species such as deer, bears, and furbearers.

Another form of mitigation, which is built into the design of the alternatives, is the location of the harvest units. Harvest units are intentionally located away from important fish and old-growth habitat, to the extent practicable, to reduce effects on these habitats. The proximity to prior harvest units is also considered so as to reduce cumulative effects, particularly as they relate to successive harvests within a single watershed. Beach fringes and estuarian habitats are also avoided as much as possible.

Foreseeable Long-Term and Cumulative Effects

The FEIS evaluates the reasonably foreseeable future effects of each alternative. The Forest Service is uncertain about the site specific locations of future activities associated with long-term programmatic projections. The precise location of future projects is not known until the project is proposed. The Subsistence Evaluation for the long-term programmatic effects will conclude whether or not future activities may restrict subsistence uses.

The Wildlife section projects this level of harvest will affect the habitat capability of several wildlife species. The changes in habitat capability could affect their abundance and distribution. The potential decrease in abundance could increase competition for those species. Most of these species are important subsistence resources used by the rural communities surrounding the project area. Actions on other lands surrounding the project area could also affect the abundance or distribution, access to, and competition for the subsistence resources harvested by the rural communities using the project area.

Enough is known about Forest Service programmatic activities and potentially foreseeable activities on other lands surrounding the project area to project that subsistence uses may be significantly restricted at sometime in the future.

The Forest Service is revising TLMP through the NEPA process. Potential effects to subsistence users will be addressed during the revision. Future project environmental analyses will be required prior to harvest of any additional timber beyond the amount proposed in this project. Subsistence use effects will be evaluated in those analyses.

Should subsistence resources become limiting at some point, the Federal Subsistence Board has the authority to regulate non-subsistence uses of these resources. This type of action, as prescribed by ANILCA Section 804, may be necessary to ensure the availability of adequate subsistence resources needed by rural communities at some point in the future.

Final Conclusions

Section 810 (a) (3) of ANILCA states that when a use, occupancy, or disposition of federal lands significantly restricts subsistence uses, determinations also must be made that the proposed action (1) is necessary, consistent with sound management of public lands, (2) involves the minimum amount of public lands necessary to acocmplish its purpose, and

(3) reasonable steps will be taken to minimize adverse impacts on subsistence uses and subsistence resources resulting from the action. As stated in the findings above:

> The potential foreseeable effects from the action alternatives of the proposed project in the George and Carroll Inlet area present no, or only a slight significant possibility of a significant restriction of subsistence uses of wildlife, fish, shellfish, timber and other foods.

Necessity (Consistent With Sound Management of Public Lands)
The actions proposed in this document have been examined to determine whether they are necessary, consistent with the sound management of public lands and achieve multiple use management objectives in the Tongass Land Management Plan. Standards used for the review include (1) the National Forest Management Act of 1976 and its implementing regulations; (2) the Alaska National Interest Land Conservation Act; (3) the Alaska Regional Guide; (4) the Tongass Land Management Plan; (5) the Tongass Timber Reform Act; (6) the Alaska State Forest Practice Act; and (6) the Alaska Coastal Management Program.

Based on the analyses presented in Chapters 1, 2, and 4, the selected alternative is necessary and consistent with the sound management of public lands.

Amount of Land
The amount of land necessary to undertake the proposed action could not be lessened without increasing subsistence impacts. The alternatives represent a balance between impacting the fewest acres, meeting existing contract commitments, and minimizing impacts on other resources. Thus the minimum amount of public land necessary to meet the proposed actions purpose is consistent with the standards referenced above.

Steps Taken to Minimize Adverse Actions on Subsistence Uses and Resources
Chapter 2 displays the Standards and Guidelines and Mitigation Measures which will be implemented as part of the selected alternative. Most are designed to maintain fish and wildlife habitat productivity at as high a level as possible, consistent with meeting existing timber harvest contract commitments.

Other Environmental Considerations

Unavoidable Adverse Environmental Effects

All action alternatives would cause some adverse environmental effects. These are usually restricted and local in extent. The type, intensity, and duration depends on each alternative and the mitigation measures applied to protect the resource. The effects generally include increased soil loss above the naturally occurring level and short-term reductions in water and air quality, alteration of natural landscapes, increased competition for resources, and the disturbance and loss of some wildlife habitat.

Where established legal limits exist, adverse effects would fall within the legal limit. The effects would be short term, usually less than two years. The Monitoring and Mitigation Measures displayed in Chapter 2 would be used to reduce adverse impacts.

Irreversible and Irretrievable Commitments of Resources

Irreversible resource commitments created by the action alternatives include rock removal for road and facility construction and the use of nonrenewable energy resources for management.

The irretrievable resource commitment for the No Action Alternative is the growth and mortality of timber differing from harvest. For the action alternatives, irretrievable losses include timber growth, wildlife habitat, and some primitive recreation opportunities lost

due to road and facitity construction. These losses are quantified earlier in this section of this document.

Urban Quality, Historic and Cultural Resources

The goal of the Forest Service's Cultural Resources Management Program is to preserve significant cultural resources in their field context and to ensure that such resources remain available for different uses on a long-term basis. These uses include reserve, social/cultural purposed, recreation, and education. The alternatives have been determined to provide adequate standards to protect cultural resources and meet the goals of that program.

Chapter 5

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Chapter 5

List of Preparers

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Chapter 6

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Chapter 6

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Friends of Revilla
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Island News
Juneau Chamber of Commerce
Ketchikan Chamber of Commerce
Ketchikan Daily News
Ketchikan Fish and Game Advisory Committee
Ketchikan Gateway Borough
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Ketchikan Pulp Company
Ketchikan Visitors Bureau
Klukwan Forest Products
Mayor, City of Ketchikan
Mayor, City of Metlakatla
National Marine Fisheries Service
Petersburgh Chamber of Commerce

SCLDF
SEACC
Sealaska Corporation
Seley, Inc.
Sitka Chamber of Commerce
State of Alaska, Office of General Counsel
State of Alaska, Office of the Governor
State of Alaska, Office of Management and Budget
Tongass Conservation Society
Tongass Sportfishing Association
United Fishermen of Alaska
University of Alaska Southeast
U.S. Army Corps of Engineers
USDA-Forest Service, Admiralty National Monument
USDA-Forest Service, Craig Ranger District
USDA-Forest Service, Juneau
USDA-Forest Service, Juneau Ranger District
USDA-Forest Service, Ketchikan Ranger District
USDA-Forest Service, Misty Fiords National Monument
USDA-Forest Service, Petersburg Ranger District
USDA-Forest Service, Sitka Ranger District
USDA-Forest Service, Thorne Bay Ranger District
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Chapter 7

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Chapter 8

Glossary and Acronyms

Chapter 8

Glossary and Acronyms

Glossary

Adjacent harvest—Used to indicate when activity is projected to occur near the upper banks of an active stream bank.

Alaska National Interest Lands Conservation Act (ANILCA)—Passed by Congress in 1980, this legislation designated 14 national forest wilderness areas in southeast Alaska. In section 705(a), Congress directed that at least 40 million dollars be made available annually to the Tongass Timber Supply Fund to maintain the timber supply from the Tongass National Forest at a rate of 4.5 billion board feet per decade.

Allowable Sale Quantity (ASQ)—ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity is expressed as a board foot measure and is calculated in accordance with applicable timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest. This translates to an average annual ASQ of 450 million board feet during the 1980–89 period described in the Tongass Land Management Plan.

Amenity—Nonmarket outputs.

Antiquities Act of 1906—Provides for the protection of all historic and prehistoric ruins and objects of antiquity located on Federal lands by providing criminal sanctions against excavation, injury, removal, or destruction of such antiquities without the permission of the Secretary of Department having jurisdiction over such resources.

Anadromous—Fish that travel from saltwater to freshwater to reproduce. Some anadromous fish species also spend a significant part of their early life stage in freshwater.

Appraisal—See Timber appraisal.

Aquatic Habitat Management Unit (AHMU)—A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy and plans.

Baby Squares—Small rough sawn, squared timbers having a specified thickness, 4-1/8 inches or 105 centimeters.

Beach fringe habitat—Wildlife habitat that occurs 600 feet inland from the intertidal zone plus islands of less than 50 acres.

Best Management Practice (BMP)—A practice or combination of practices that is determined by a State, after problem assessment, examination of alternative practices, and appropriate public participation, to be the most effective, practicable means of preventing or

reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. It is not the site-specific prescription, but an action-initiating mechanism that eventually leads to the interdisciplinary development of a site-specific prescription.

Cant—A log partly or wholly cut and destined for further processing.

Carry capacity—The number of animals that a habitat can maintain in a healthy, vigorous condition.

Commercial forest land (CFL)—Productive forest land that is producing or capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management to grow crops of industrial wood generally of a site quality capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre.

> ***Normal CFL:*** Timber that can be economically harvested using locally available logging systems. Composed of two categories:
>
> > ***Standard:*** Timber that can be economically harvested with locally available logging systems such as highlead or shortspan skyline.
> >
> > ***Special:*** Timber that can be harvested with locally available logging systems, but that lies in areas where special consideration is needed to protect other resources.
>
> ***Nonstandard CFL:*** Timber that cannot be harvested with locally available logging systems and would require the use of other logging systems such as helicopter or long-span skyline.

Deer winter range (DWR)—Elements of habitat that make up Sitka black-tailed deer winter range under moderately severe or severe winter conditions.

Dissolving Pulp—(Special Alpha Grade) is produced from wood fibers and is a basic raw material for rayon, cellophane, and to a lesser extent, acetate.

Distance zones—Divisions of a particular landscape being viewed, used to describe the part of a characteristic landscape that is being evaluated. The three distance zones are:

> ***Foreground:*** Areas within 1/4 to 1/2 mile of the observer. The limit of this zone is based upon distances at which details can be perceived.
>
> ***Middleground:*** Extends from foreground zone to 3 to 5 miles from the observer.
>
> ***Background:*** Extends from middleground to infinity.

Eagle nest tree buffer zone—A 330-foot radius around eagle nest trees established in a Memorandum of Understanding between the Fish and Wildlife Service and the Forest Service.

Emphasis species—The following categories were used where appropriate: Endangered and threatened plant and animal species identified on State and Federal lists; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; additional plant or animal species selected because their population changes are believed to indicate effects of management activities on other species of a major biological community or water quality.

Entry—Harvest of a specific portion of the total rotational volume.

Estuarine habitat—Grassflat plus mudflat, plus a 1000-foot buffer for major estuaries over 10 acres.

Estuary—For purpose of this EIS process, estuary refers to the relatively flat, intertidal, and upland areas, generally found at the heads of bays and mouths of streams. They are dominantly mud and grassflats and unforested except for scattered spruce or cottonwood.

Existing visual condition—The level of visual quality or condition presently occurring on the ground.

Extended Rotation—The extension of a rotation (120 to 200 years) to mitigate impacts of timber harvest on the visual characteristics of a landscape.

Fish habitat enhancement opportunities—Ways to improve or increase fish habitat, for example fish ladders.

Fish habitat management unit—An area of stream and associated streamside habitat identified during the interdisciplinary process as having values important to fish habitat such that timber management practices and other land-use activities will be prescribed to meet fish management goals.

Flitches—Sawn logs and cants from which veneer slices are made.

Floodplain—The lowland and relatively flat areas joining inland and coastal waters, including debris cones and floodprone areas of offshore (100 year recurrence) or greater chance of flooding in any given year.

Forested habitat—All areas with forest cover. Used in this document to represent a general habitat zone.

High Lead Cable Logging—A method of transporting logs to a collecting point by using a powered cable, passing through a block fastened off the ground, to lift the front end of the logs clear off the ground while they are in transit.

Inland wetland habitat—Lakes, beaver ponds, and associated grass/sedge meadows greater than 10 acres, plus a 500-foot buffer.

Land use designation (LUD)—The method of classifying land used by the Tongass Land Management Plan. Land uses and activities are grouped to define, together with a set of coordinating policies, an essentially compatible combination of management activities. A brief description of the four classifications follows:

LUD I: Wilderness areas.

LUD II: These lands are to be managed in a roadless state to retain their wildland character, but this designation would permit wildlife and fish habitat improvement and primitive recreational facility development and roads under special authorization.

LUD III: These lands are to be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits.

LUD IV: These lands will provide opportunities for intensive resource use and development, where emphasis is primarily on commodity or market resources.

Layout—Planning and mapping (using aerial photos) of harvest and road systems needed to totally harvest a given area.

Logging camp—A temporary facility established to house industry and Forest Service personnel while timber harvest occurs in an area.

Log Grade—An established quality or use classification of timber indicating value. Forest Service timber grades consider log diameter, length, and other criteria. Grade criteria vary by species. However, for Sitka spruce and western hemlock, the grades range from Select and Feeler grade (the highest quality) to lower quality logs suitable only for pulpwood.

Log Transfer Facility—A facility located where the road network terminates. May be used for a number of transportation purposes. For timber harvesting, the terminal transportation facility is where logs are bundled and placed into rafts on the water for towing to local mills. The transfer facility is also called a log transfer facility when the facility is used only for logging.

Nonstandard Logging Systems—These systems are not in predominant use on the Tongass National Forest. Nonstandard systems include multi-span skyline, long single span skylines (skylines with a reach over 2,600 feet) and helicopters.

Macroinvertebrates—A range of animals without backbones, generally larger than 1mm. For example: crabs, clams, and marine worms.

Management area—Areas, one or more VCUs in size, for which management direction was written in the Tongass Land Management Plan.

Management techniques (prescriptions)—A set of treatments or practices designed to develop and/or protect some combination of resources.

Marginal timber—Timber that, because of resource constraints, inaccessability, or low product value (or any combination thereof) cannot be harvested economically.

Mass failure—The downslope movement of a block or mass of soil. This usually occurs under conditions of high soil moisture, and does not include individual soil particles displaced as surface erosion.

Mass Movement Index—A rating system used to describe relative soil mass movement potential for different soil types.

MBF/MMBF—Respectively, one thousand board feet and one million board feet.

Mitigation—Includes avoiding an impact altogether by not taking a certain action or part of an action; minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

Multi-entry layout—The size, pattern, and distribution of multi-resource characteristics of an entire timber compartment programmed for at least one rotation.

National Historic Preservation Act—Established 1966, amended 1976 and 1980. Expresses the general policy of supporting and encouraging the preservation of prehistoric and historic resources for present and future generations by directing Federal agencies to assume responsibility for considering historic resources in their activities. Section 106 of NHPA requires that Federal agencies consider the potential effect proposed activities may have upon prehistoric and historic resources. Prior to the approval of any Federal undertaking, agencies must undergo such planning and action to locate and protect all properties that may be eligible for inclusion to the National Register of Historic Places. National Register Of Historic Places (National Register): Maintained by the Secretary of the

Interior, the National Register is composed of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture.

Over mature timber—This term is used in relation to a desirable rotation. Over mature trees are trees that have reached a culmination of mean annual increment.

Producing capability—This concept refers to the inherent ability of stream habitats to produce fish.

Recreation opportunity spectrum (ROS)—The framework for planning and managing the recreation resource. Consists of six classes from primitive to urban. Each class is defined in terms of the extent to which the natural environment has been modified, the type of facilities developed, and the degree of outdoor skills needed to enjoy the area.

Resident fish—Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish include nonanadromous Dolly Varden char and cutthroat trout.

Retention factor—The amount of commercial forest land removed from the timber base to protect other resource values. These factors are allowances available to draw upon when meeting other resource needs and are not fixed policies to be rigidly applied by the IDT or Forest Supervisors.

Rights-of-way—The privilege which a person or persons may have of passing over the land of another.

Road, Arterial—This functional class of road provides service to large land areas and usually connects with public highways or other forest arterial roads to form an integrated network of primary travel routes.

Road, Collector—This functional class of road serves smaller land areas and usually connect to a forest arterial or public highway. They collect traffic from forest local roads.

Road, Local—This functional class of road provides access for a specific resource use activity, such as a timber sale or recreation site, although other minor uses may be served.

Road Maintenance objectives—The three levels of road maintenance objectives are:

> ***Level 3:*** This level is assigned where management direction requires the road to be open and maintained for safe travel by a prudent driver in a passenger car. Traffic volumes are minor to moderate; however, user comfort and convenience is not considered a priority. Roads at this maintenance level are normally characterized as low speed, single land with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. The functional classification of these roads is normally local or minor collector.
>
> ***Level 2:*** This level is assigned where management direction requires that the road be open for limited passage of traffic. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Roads in this maintenance level are normally characterized as single lane, primitive type facilities intended for use by high clearance vehicles. Passenger car traffic is not a consideration.
>
> ***Level 1:*** This level is assigned to intermittent service roads during the time management direction requires that the road be closed or otherwise blocked to traffic. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

Roads receiving Level 1 maintenance may be of any type, class, or construction standard and may be managed at any other maintenance level during the time management direction requires that they be open for traffic. However, while being maintained at Level 1, they are closed or blocked to traffic.

Roads, Forest development—For national forest timber sales, specified roads are all roads, including related transportation facilities, which become part of the permanent forest transportation network after the sale is completed.

Roads, Temporary—For national forest timber sales, temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the permanent forest transportation network, and have stream crossing structures removed, erosion measure put into place, and the road closed to vehicular traffic after harvest is completed.

Rotation—The planned number of years (approximately 100 years in Alaska) between the formation of regeneration of a stand and its final cutting at a specified stage of maturity.

Sensitivity level—The measure of people's concern for the scenic quality of the National Forests. In 1980, the Tongass National Forest assigned sensitivity levels to land areas viewed from boat routes and anchorages, plane routes, roads, trails, public use areas, recreation cabins and to the land areas seen from use areas or routes.

Level 1: A rating given generally to nationally or regionally important travel routes such as State highways, Alaska Marine Highway, important small boat routes or boating or fishing areas, frequently used anchorages, most recreation sites such as recreation cabins, campgrounds and picnic areas, trails and some areas or sites with high recreation potential. This rating is assigned also to the land seen from these routes or use areas.

Level 2: A rating given to less frequently traveled boat routes, most other arterial forest roads, less frequently used anchorages and boating areas, and some infrequently or moderately used dispersed recreation sites. This rating is assigned also to the land seen from these routes or use areas.

Level 3: Other roads, saltwater areas, lakes or areas and sites that get very little public use and have little or no recreation potential. A rating that is also assigned to all land not seen from the above level 1 and 2 areas.

Service life—Transportation facilities are developed and operated for varying time periods, depending on land and resource management objectives, type of facility, and needs for access. Service life can be one of the following:

Long-term constant service: Facilities developed and operated for continuous for annual recurrent service.

Long-term intermittent service: Facilities developed and operated for periodic service and closed for more than 1 year between periods of use.

Silvicultural Priority—A general risk classification system grouping stands into three broad categories of risk:

High risk: Stands in this category are typically old growth, aged 150 years or greater. Annual growth is low to negative. Stands may be heavily infected withdrawn mistletoe. Broken tops, dead tops, dead trees, and blowdown trees are evident. The spruce component is typically less than 20% of the stand.

Medium risk: These include mature stands in excess of 100 years that are still growing vigorously. Stands have uniform crowns with few holes in the canopy. The spruce component of the stand is usually greater than 20%. Snags are few in number and dead and dying trees are rare. The stands are adding volume each year and are expected to continue growth into the next entry.

Low risk: These stands are usually less than 100 years of age. They are even-aged. Crowns are small, uniform, with no gaps.

Site Index—A measure of the relative productive capacity based on height of the dominant trees in a stand at a chosen age (100 years in this final EIS).

Soil hazard areas—Mapped areas within which various soil hazards may be encountered. Hazards include mass failures and high sediment production during road construction.

Standard Logging Systems—Referred to as normal logging systems in the Timber and Silviculture Resource Report. These systems include highlead, A-frame, single span skyline (skyline with a reach less than 2,600 feet), and tractor.

Stream classification system—Defines habitat capacity (how many fish a stream channel can produce) and hydrologic and riparian sensitivity.

Streamside management techniques (prescription)—A riparian area management prescription that describes protective measures so that resource development activities do not adversely affect the maintenance of riparian area dependent resources. Preferential consideration is given to riparian area dependent resources over other resources and activities when conflicts occur.

Stumpage Receipt—The value of timber as it stands uncut in terms of an amount per cubic unit (thousand board feet for the APC long-term timber sale contract).

Temperature sensitive streams—Streams susceptible to warming beyond an acceptable level.

Timber appraisal—Establishing the fair market value of timber by taking the selling value minus manufacturing costs and the cost of getting logs from stump to manufacturer and an allowance for profit and risk.

Tongass Land Management Plan (TLMP)—The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried on within the forest. TLMP will be revised in 1990. See also Land Use Designations.

Traffic service level—Describes the significant traffic characteristics and operating conditions for a forest transportation facility. These levels are identified as a result of transportation planning activities. Objectives are established for each road.

Utility Logs—Are those logs which do not meet saw-log grade, but are suitable for the production of firm useable pulp chips.

Value comparison unit (VCU)—These areas, which generally encompass a drainage basin, were established on the Tongass National Forest to provide a common set of areas where resource inventories could be conducted and resource interpretations made. The VCUs included in the study area are displayed on Map 1–2.

V-notch—A V-shaped stream channel generally on steep, mountainous terrain.

Visual quality objectives (VQOs)—Measurable standards reflecting five different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The six categories of VQOs are:

> ***Preservation:*** Permits ecological changes only. Applies to wilderness areas and other special classified areas.
>
> ***Retention:*** Provides for management activities that are not visually evident; requires reduction of contrast through mitigation measures either during or immediately after operation.
>
> ***Partial Retention:*** Management activities remain visually subordinate to the natural landscape. Mitigation measures should be accomplished within 1 year of project completion.
>
> ***Modification:*** Management activities may visually dominate the characteristic landscape. However, activities must borrow from naturally established form, line, color, and texture so that its visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.
>
> ***Maximum Modification:*** Management activities may so completely dominate the landscape that only from distant viewing positions does the activity appear to blend to any degree into the natural landscape.
>
> ***Unacceptable Modification:*** Is not an objective but describes a condition where the extent of management activities is excessive and poorly related to the surrounding landform and vegetative patterns.

Volume class—Average timber stand volume, given as thousand board feet per acre. The volume classes used in this EIS are: 8–20, 20–30, 30–50, and 50+ MBF/acre.

Waneys—Semi-processed rough sawn logs meeting Federal primary manufacturing requirements. Rough sawn logs have at least two sides sawn and have a maximum thickness of 8-3/4 inches.

Wetlands—Those areas that are inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds.

Wildlife Habitat Management Unit—An area of wildlife habitat identified during the IDT process as having values important to wildlife.

Acronyms

ACMP	Alaska Coastal Management Plan
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Units
AM	Access Management
ANILCA	Alaska National Interest Lands Conservation Act
ANCSA	Alaska Native Claims Settlement Act
APC	Alaska Pulp Corporation (Sitka)
APS	Alaska Public Survey
ASQ	Allowable Sale Quantity
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
DBH	Diameter Breast Height
DEIS	Draft Environmental Impact Statement
DWR	Deer Winter Range
EIS	Environmental Impact Statement
FDR	Forest Development Road
FEIS	Final Environmental Impact Statement
FHMU	Fisheries Habitat Management Unit
FWS	Fish and Wildlife Service
GIS	Geographic Information System
GMU	Game Management Unit
IDT	Interdisciplinary Team
IDWR	Intermediate Deer Winter Range
KDWR	Key Deer Winter Range
KPC	Ketchikan Pulp Company
LOD	Large Organic Debris
LSTI	Logging Systems Transportation Inventory
LTF	Log Transfer Facility
LUD	Land Use Designations
MBF	Thousand Board Feet
MELP	Multi-Entry Layout Plan
MHC	Mean Habitat Capability
MLLW	Mean Lower Low Water
MMBF	Million Board Feet
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act

NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service
PMIS	Potential Management Indicator Species
RIM	Recreation Information Management
ROS	Recreation Opportunity Spectrum
RPA	Resources Planning Act
SEACC	Southeast Alaska Conservation Council
SGMM	Standards and Guidelines and Mitigation Measures
SHPO	State Historic Preservation Officer
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TTSF	Tongass Timber Supply Fund
USGS	United States Geological Survey
VCU	Value Comparison Unit
VQL	Visual Quality Level
VQO	Visual Quality Objective
WHU	Wildlife Habitat Unit

Chapter 9

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Chapter 9

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Appendices

Appendix A

Units Over 100 Acres

Appendix A

Units Over 100 Acres

NFMA regulations provide that 100 acres is the maximum size of created openings to be allowed for the hemlock–Sitka spruce forest type of coastal Alaska, unless excepted under specific conditions. The Alaska Regional Guide (p. 3–20) provides:

> Recognizing that harvest units must be designed to accomplish management goals, created openings may be larger where larger units will produce a more desirable contribution of benefits. Factors to be considered to determine when a larger size may be permitted are:
>
> 1. Topography.
> 2. Relationship of units to other natural or artificial openings and proximity of units.
> 3. Coordination and consistency with adjacent management areas.
> 4. Effect on water quality and quantity.
> 5. Visual absorption capacity.
> 6. Effect on wildlife and fish habitat.
> 7. Regeneration requirements for desirable tree species, based upon latest research.
> 8. Transportation and harvesting system requirements.
> 9. Natural and biological hazards to the survival of residual trees and surrounding stands.
> 10. Relative total costs of preparation, logging, and administration of harvest cuts.
>
> Where it is determined by the interdisciplinary team that exceptions to the size limitation are warranted, the actual size limitation of openings may be up to 100 percent greater for factor 9 and up to 50 percent greater for all other factors with the approval of the Forest Supervisor.
>
> Exceptions to the 100-acre size limit in excess of 50 percent greater (100 percent greater for factor 9) are permitted on an individual timber sale basis after 60 days public notice, and review and approval by the Regional Forester.

The following tables display the units by alternative which exceed 100 acres in size. The reasons for exceeding the size limits are also displayed.

Table 1

Units over 100 acres in size

Alternative 2

Unit	Acres	Reason
9	110	1, 8, 10

Alternative 3

Unit	Acres	Reason
22	106	1, 8, 10

Alternative 4

Unit	Acres	Reason
7	126	1, 8, 10
23	171	1, 8, 10
24	115	1, 8, 10
25	105	1, 8, 10
44	121	1, 8, 10
51	169	1, 8, 10

Alternative 5

Unit	Acres	Reason
26	110	1, 6, 8, 10
47	135	1, 6, 8, 10

Alternative 6

Unit	Acres	Reason
9	124	1, 8, 10
15	135	1, 8, 10

Appendix B

Mitigation Measures

Appendix B

Mitigation Measures

Soils

Estimate of Areas Requiring Partial or Full Suspension

Tables 1 through 5 estimate areas where full or partial suspension of logs during yarding operations will be necessary. Section 2 discusses standards, guidelines and mitigation measures for harvest units having high or very high mass movement index rating (MMI). Many of the standards and guidelines apply to all harvest units.

Full suspension will be required on very high MMI soils. Resulting ground disturbance shall not exceed 5 percent of the harvest unit. All harvest proposed on very high MMI soils will be investigated by a soil scientist prior to unit release to ensure that the area is avoided or appropriate site specific mitigation is applied.

On high MMI soils partial suspension is required. Resulting ground disturbance shall not exceed 10 percent of the harvest unit.

Many of the high and very high MMI soils occur in complex soil units. A complex is an area of two or more dissimilar soil components occurring in regularly repeating patterns but cannot be mapped separately at a scale of 1:24,000. Values for Tables 1 through 5 were derived using percent composition of each soil component. These percentages were determined during the soil inventory on the Ketchikan area. Exact location of soils having high or very high MMI cannot be determined based on available maps. Field investigations are necessary to establish location, extent and magnitude of the soil's instability.

Column 1 lists the VCU number where the harvest unit will be located.

Column 2 lists the harvest unit number.

Column 3 lists acres of high MMI soils within the harvest unit.

Column 4 lists acres of very high MMI soils within the harvest unit.

TABLE 1- ESTIMATE OF AREAS REQUIRING PARTIAL OR FULL SUSPENSION - ALTERNATIVE 2

VCU UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
1	0.00	0.00
2	0.00	0.00
3	1.74	0.00
4	0.00	0.00
5	0.00	0.00
9	0.00	0.00
10	43.87	0.00
34	0.00	0.00
44	27.45	0.00
	---------	--------
746	73.05	0.00
6	0.00	0.00
7	2.21	0.00
8	0.00	0.00
11	36.21	0.00
12	46.48	0.00
13	63.37	0.00
14	39.51	0.00
15	0.00	0.00
16	0.00	0.00
18	19.73	0.00
19	2.54	0.00
20	0.00	0.00
21	11.70	0.00
22	34.30	0.00
23	42.78	0.00
24	87.84	0.00
25	3.92	0.00
26	0.00	0.00
27	6.23	0.00
28	1.87	0.00
29	1.74	0.00
32	1.51	0.00
35	19.53	0.00
36	44.52	0.04
37	42.66	0.00
38	46.51	0.00
39	47.95	0.00
40	23.94	0.00
41	9.69	0.00
42	14.54	11.20
43	0.00	12.54
	---------	---------
747	670.27	23.78

VCU UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
30	12.17	0.00
31	20.69	0.00
32	10.29	0.00
33	24.88	0.00
	---------	---------
748	68.03	0.00
TOTAL	811.34	23.78

TABLE 2.-ESTIMATE OF AREAS REQUIRING PARTIAL OR FULL SUSPENSION - ALTERNATIVE 3

VCU	UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
	1	0.00	0.00
	2	0.00	0.00
	3	22.88	0.00
	4	21.46	0.00
	5	5.90	0.00
	6	0.00	0.00
	7	18.29	0.00
	8	41.78	0.00
	9	11.87	0.00
	10	14.75	0.00
	11	0.00	0.00
	12	0.00	0.00
	13	1.74	0.00
	14	0.00	0.00
	15	0.00	0.00
	16	12.91	0.00
	17	0.00	0.00
	18	0.00	0.00
	19	0.00	16.59
	29	0.00	0.00
746		151.58	16.59

VCU	UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
	20	31.52	0.00
	21	30.76	0.31
	22	90.48	15.33
	23	19.52	0.00
	24	67.50	0.00
	25	47.95	0.00
	26	16.14	0.00
	27	2.21	0.00
	28	0.00	0.00
	29	0.00	0.00
	30	0.00	0.00
	31	0.00	0.00
	32	35.55	0.00
	33	68.26	0.00
	34	76.11	0.00
	35	26.29	0.00
	36	9.34	0.00
	37	26.33	0.00
	38	15.66	0.00
	39	63.37	0.00
	40	55.16	0.00
	41	14.95	0.00
	42	9.47	0.00
	43	30.66	0.00
	44	0.93	0.00
	45	0.88	0.00
	46	0.00	0.00
	47	1.87	0.00
	48	1.74	0.00
	50	2.68	0.00
747		745.35	15.64
	49	27.39	0.00
	50	12.85	0.00
	51	44.30	0.00
748		84.54	0.00
TOTAL		981.46	32.22

TABLE 3-ESTIMATE OF AREAS REQUIRING PARTIAL OR FULL SUSPENSION - ALTERNATIVE 4

VCU	UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
	1	0.00	0.00
	2	16.83	0.00
	3	11.72	0.00
	4	22.95	0.00
	5	25.58	0.00
	6	37.17	0.00
	7	89.91	0.00
	21	0.00	0.00
	22	0.00	0.00
	23	6.98	89.40
	24	0.00	69.18
	25	0.00	51.31
	26	0.00	0.00
	27	0.00	0.00
	34	0.00	0.00
	35	1.74	0.00
	36	0.00	0.00
	37	0.00	0.00
	38	0.00	0.00
	41	0.00	0.00
	42	31.04	0.00
746		243.93	209.88
	28	80.90	0.04
	29	42.66	0.00
	30	48.30	0.00
	31	95.03	0.00
	32	46.51	0.00
	33	57.37	0.00
	38	0.00	0.00
	39	2.65	0.00
	40	0.00	0.00
	43	57.61	0.00
	44	70.79	0.00
	45	63.37	0.00
	46	55.16	0.00
	47	0.00	0.00
	48	27.61	0.00
	49	34.30	0.00
	50	20.76	0.00
	51	38.09	0.00
747		741.12	0.04
	8	31.57	0.00
	9	9.91	0.00
	10	30.57	0.00
	11	34.47	0.00
	12	4.73	0.00
	13	5.59	0.00
	14	41.95	0.00
	15	49.55	0.00
	16	32.84	0.00
	17	51.43	0.00
	18	17.70	0.00
	19	19.38	0.00
	20	11.23	0.00
753		340.91	0.00
TOTAL		1,325.95	209.91

TABLE 4-ESTIMATE OF AREAS REQUIRING PARTIAL OR FULL SUSPENSION - ALTERNATIVE 5

VCU	UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
	1	0.00	0.00
	2	5.90	0.00
	3	0.00	0.00
	4	18.29	0.00
	5	41.78	0.00
	6	11.87	0.00
	7	14.75	0.00
	8	13.84	0.00
	9	11.72	0.00
	10	21.45	0.00
	11	23.99	0.00
	12	12.76	0.00
	13	50.99	0.00
	14	0.00	0.00
	15	0.00	0.00
	16	0.00	0.00
	17	0.00	0.00
	18	0.00	16.59
	22	1.74	0.00
	26	0.00	0.00
	27	56.63	0.90
	47	8.36	0.00
	48	37.37	0.00
		---------	---------
746		331.44	17.48
	19	31.52	0.00
	20	30.76	0.31
	21	90.48	15.33
	23	63.37	0.00
	24	51.86	0.00
	25	2.21	0.00
	28	0.00	0.00
	29	0.00	0.00
	30	76.11	0.00
	31	35.55	0.00
	32	0.18	0.00
	33	65.75	0.00
	34	0.13	0.00
		---------	---------
747		447.93	15.64
	35	19.38	0.00
	36	11.23	0.00
	37	17.70	0.00
	38	51.43	0.00
	39	5.59	0.00
	40	41.95	0.00
	41	49.55	0.00
	42	32.84	0.00
	43	4.73	0.00
	44	34.04	0.00
	45	30.57	0.00
	46	9.91	0.00
	47	72.45	0.00
		---------	---------
753		381.37	0.00
TOTAL		1,160.73	33.12

TABLE 5-ESTIMATE OF AREAS REQUIRING PARTIAL OR FULL SUSPENSION - ALTERNATIVE 6

VCU	UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
	1	0.00	0.00
	2	13.84	0.00
	3	11.72	0.00
	4	21.45	0.00
	5	31.44	0.00
	6	23.99	0.00
	7	12.76	0.00
	8	50.99	0.00
	15	9.17	0.00
	16	37.37	0.00
	17	0.00	0.00
	18	0.00	0.00
	19	1.74	0.00
	20	0.00	0.00
	21	30.41	0.00
	22	0.00	0.00
	23	0.00	0.00
		---------	---------
746		244.88	0.00

VCU	UNIT #	ACRES HIGH MMI	ACRES V.HIGH MMI
	24	23.07	0.00
	25	80.90	0.04
	26	42.66	0.00
	27	46.51	0.00
	28	73.78	0.00
	29	21.97	0.00
	30	0.00	0.00
	31	2.21	0.00
	32	0.00	0.00
	33	0.00	0.00
	34	76.11	0.00
	35	35.55	0.00
	36	65.75	0.00
	37	9.78	0.00
	38	63.37	0.00
	39	51.97	0.00
	40	51.86	0.00
	41	26.29	0.00
	42	0.00	0.00
	43	0.00	0.00
	44	11.39	0.00
	45	34.30	0.00
	46	1.34	0.00
	47	10.23	0.00
	48	4.11	0.00
	49	0.00	0.00
	50	9.11	0.00
	51	7.92	0.00
	52	11.74	0.00
	53	7.69	0.00
	54	9.65	0.00
	55	1.87	0.00
	56	3.81	0.00
	57	13.48	0.00
		---------	---------
747		798.46	0.04
	58	24.87	0.00
	59	31.53	0.00
		---------	---------
748		56.40	0.00
	9	74.36	0.00
	10	27.96	0.00
	11	36.40	0.00
	12	4.28	0.00
	13	0.86	0.00
	14	18.21	0.00
	15	71.64	0.00
		---------	---------
753		233.71	0.00
TOTAL		1,333.45	0.04

Estimate of Proposed Roads Requiring Full Bench or Full Bench End-Haul Construction

Table 6 estimates miles of road where full bench or full bench and end-haul may be necessary for each action alternative. Section 2 discusses standards and guidelines and mitigation measures for road construction and maintenance. Many of the SGMMs apply to all roads. The following data are for miles of road overlying high or very high mass movement index (MMI) soils. Field review of these roads is needed to verify if, indeed, these mitigation measures are appropriate.

On slopes over 60 percent, full bench construction is recommended (high MMI soils). On very high MMI soils full bench and end-haul will be required. Generally these soils occur on slope gradients greater than 75 percent. In addition, all construction on very high MMI soils will be investigated by a soil scientist prior to construction to ensure that the area is avoided or to apply appropriate site specific mitigation measures.

Column 1 lists the VCU number where the road segment will be located.

Column 2 lists the miles of road overlying high MMI soils.

Column 3 lists the miles of road overlying very high MMI soils.

It is important to remember that although the lengths of road segments were measured on high or very high mass movement index soils as mapped in the GIS, there are many instances where the exact location of the road may be on moderate or low MMI soils. This is because there are many inclusions of soils and landforms that do not appear on the mapped soil unit due to mapping scale. For example, benches are oftentimes inclusions within a mapping unit because they are generally narrow, discontinuous landforms which are not identifiable on aerial photographs (1:24,000). Benches are also the dominant landforms where roads are laid out in the field. These situations can only be clearly identified in the field. The GIS is only a red flag for potentially unstable road segments.

Lengths of road segments on potentially unstable soils are based on percent composition of the soil type in the map unit. Locations of high and very high MMI soils listed in this table may not match exact locations of the proposed road prism.

TABLE 6. Estimate of proposed miles of road requiring full bench or full bench and end-haul road construction by VCU and alternative (action alternatives only).

Alternative 2

VCU	MILES ROAD ON HIGH MMI SOILS	MILES ROAD ON VERY HIGH MMI SOILS
	0.00	0.00
742	0.00	0.00
	0.64	0.36
746	0.64	0.36
	8.77	0.14
747	8.77	0.14
	0.23	0.00
748	0.23	0.00
Total	9.64	0.49

Alternative 3

VCU	MILES ROAD ON HIGH MMI SOILS	MILES ROAD ON VERY HIGH MMI SOILS
	0.00	0.00
742	0.00	0.00
	2.18	0.69
746	2.18	0.69
	9.34	0.49
747	9.34	0.49
	0.34	0.00
748	0.34	0.00
Total	11.86	1.18

Alternative 4

VCU	MILES ROAD ON HIGH MMI SOILS	MILES ROAD ON VERY HIGH MMI SOILS
	0.00	0.00
	------------	------------
742	0.00	0.00
	6.60	5.01
	------------	------------
746	6.60	5.01
	7.23	0.00
	------------	------------
747	7.23	0.00
	6.12	0.00
	------------	------------
753	6.12	0.00
Total	19.96	5.01

Alternative 5

VCU	MILES ROAD ON HIGH MMI SOILS	MILES ROAD ON VERY HIGH MMI SOILS
	3.94	0.69
	------------	------------
746	3.94	0.69
	3.59	0.49
	------------	------------
747	3.59	0.49
	6.68	0.00
	------------	------------
753	6.68	0.00
Total	14.20	1.18

Alternative 6

VCU	MILES ROAD ON HIGH MMI SOILS	MILES ROAD ON VERY HIGH MMI SOILS
	0.00	0.00
	------------	------------
742	0.00	0.00
	2.66	0.36
	------------	------------
746	2.66	0.36
	8.74	0.00
	------------	------------
747	8.74	0.00
	0.21	0.00
	------------	------------
748	0.21	0.00
	3.54	0.00
	------------	------------
753	3.54	0.00
Total	15.16	0.36

Visual Mitigation Measures

The key below describes the visual mitigation actions listed in the following tables under "Methods."

A. Adjust unit boundaries where possible to reduce apparent size and screen bare harvested ground to minimize impact of harvest clearings.

B. Adjust dispersal of harvest unit settings where possible to minimize impact of harvest clearings.

C. Shape unit boundaries to replicate nearby natural openings and landform shapes.

D. Locate unit boundaries so unit blends with topographic features such as ridges, knobs, benches and swales.

E. Adjust unit boundaries to hide unit backlines and other edges.

F. Design units and roads in specified areas to open views. Remove slash from areas adjacent to planned vistas.

G. Locate road to minimize visual impact from key view points.

H. Use full bench cut and end-haul material where slopes are too steep to hold material and/or where residual trees do not provide enough screen to permit road to meet intended visual quality objective.

I. Locate and design rockpits to minimize visual impacts. Retain screen trees where necessary to meet this objective. Fully rehabilitate rockpit area including grading floor to drain, cleanup, and finished grading of overburden and waste rock.

J. Landscape architect and project engineer will work on a case by case basis to limit R.O.W. clearing to a minimum as cut and fill slopes permit.

K. Apply grass seed and fertilizer to all cut and fill banks.

ALTERNATIVE 2- VISUAL MITIGATION MEASURES

UNIT	VQO	METHOD	SPECIAL DIRECTION
1	M	CDE	MEET MOD. VQO FROM CARROLL INLET IN COMB
-	-	-	WITH EXISTING HARVEST
34	M	CDE	" " "
3	M	CDE	" " "
	-	-	-
2	MM	CDE	MEET MAX. MOD. FROM SMALL LAKE, BUT MEET
-	-	-	MOD. VQO FROM CARROLL INLET
-	-	-	-
4	MM	CDE	DESIGN UNITS USING DESIGNATED MIT. MEAS.
-	-	-	TO MINIMIZE IMPACT AS MUCH AS POSSIBLE
5	MM	CDE	" " "
-	-	-	-
8	MM	-	NO SPECIAL MIT. MEASURES
9	MM	CDE	USE MIT. MEASURES TO MIN. VISUAL IMPACT
-	-	-	FROM SOUTH SADDLE LAKE
10	MM	CDE	" " "
44	MM		NO SPECIAL MITIGATION MEASURES
-	-	-	-
6	M	CDEGIJ	MEET MOD. VQO FROM SALT LAGOON
-	-	-	AND USE MIT. MEAS. TO MINIMIZE VISUAL
-	-	-	IMPACT OF ROAD AND ITS CONSTRUCTION
-	-	-	-
7	M	CDE	MEET MOD. VQO FROM SALT LAGOON
11	M	CDEGIJ	MEET MOD. VQO FROM SALT LAGOON, AND USE
-	-	-	MIT. MEAS. TO MINIMIZE VISUAL IMPACTS OF
-	-	-	ROAD AND ITS CONSTRUCTION.
-	-	-	-
12	MM	CDEGIJ	MEET MM FROM SALT LAGOON-USE MIT. MEAS.
	-	-	TO MINIMIZE VISUAL IMPACTS OF UNIT, AND
-	-	-	MINIMIZE VISUAL IMPACTS OF ROAD AND ITS
-	-	-	CONSTRUCTION
-	-	-	-
13	M	CDE	MEET MOD. VQO FROM SALT LAGOON
14	M	CDE	" " "
-	-	-	-
15	MM	CDEFGHIJK	USE DESIG. MIT. MEAS. TO REDUCE VISUAL
-	-	-	IMPACTS OF ROAD CONST. AND ENHANCE VIEWS
-	-	-	AND SCENIC QUALITY WHERE OPPORTUNITIES
	-	-	ARISE ALONG ALL OF MAINLINE ROAD.THOUGH
-	-	-	UNIT IS MM FROM ROAD, MEET MOD. VQO FROM
-	-	-	SALT LAGOON
18	MM	CDEFGHIJK	" " "
19	M	CDEFGHIJK	" " "
25	M	CDEFGHIJK	" " "
26	M	CDEFGHIJK	" " "
28	M	FGHIJK	USE DESIG MIT. MEAS. TO REDUCE VISUAL
-	-	-	IMPACTS OF ROAD CONST. AND ENHANCE VIEWS
-	-	-	AND SCENIC QUALITY WHERE OPPORTUNITIES
-	-	-	ARISE ALONG ALL OF MAINLINE ROAD.
29	M	FGHIJK	" " "

ALTERNATIVE 2- VISUAL MITIGATION MEASURES (cont.)

UNIT	VQO	METHOD	SPECIAL DIRECTION
~	~	~	~
20	M	CDE	MEET MOD. VQO FROM SALT LAGOON
27	M	CDE	" " "
~	~	~	~
32	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
33	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
~	~	~	FROM LEASK LAKE
31	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
~	~	~	FROM LEASK LAKE
30	MM	CDE	" " "
21	PR	ACDE	ADJUST UNIT DESIGN IF NEEDED TO MEET
			PAR. RET. FROM PATCHING LAKE (NAHA)
23	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
~	~	~	FROM HECKMAN LAKE (NAHA)
24	MM	CDE	" " "
~	~	~	~
22	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
			FROM ROAD.
17	M	ACDE	MEET MOD. VQO FROM SALT LAKE
16	M	ACDE	" " "
~	~	~	~
35	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
36	MM	CDE	" " "
37	MM	CDE	" " "
38	MM	CDE	" " "
39-43	MM		NO MITIGATION MEASURES
~	~	~	~
N.SADDLE	~	~	~
LAKES RD	M	FGHIJK	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
~	~	~	OF ROAD AND ITS CONSTRUCTION.
~	~	~	SPECIFIC AREAS SUCH AS ROAD SEGMENTS
~	~	~	WITH SCENIC VIEWS, ACCESS POINTS OR
~	~	~	TRAILHEADS TO SPECIFIC RECREATION
~	~	~	ATTRACTIONS, SPECIFIC RECREATION SITES,
~	~	~	OUTSTANDING STANDS OF OLD-GROWTH TIMBER
~	~	~	SHOULD BE IDENTIFIED AS HIGHEST PRIORITY
~	~	~	FOR SLASH REMOVAL.

ALTERNATIVE 3- VISUAL MITIGATION MEASURES

UNIT	VQO	ACTION	SPECIAL DIRECTION
1	M	CDE	MEET MOD. VQO FROM CARROLL INLET
2	M	CDE	" " "
3	M	ABCDE	" " "
4	M	ABCDE	" " "
5-7	M	CDE	" " "
11	M	CDE	" " "
17	M	CDE	" " "
18	M	CDE	MEET MOD. VQO FROM CARROLL INLET AND
~	~	~	PARTIAL RETENTION FROM NORTH SADDLE L.
19	M	CDE	MEET MOD. VQO FROM CARROLL INLET
~	~	~	~
12	M	ACDE	MEET MOD. VQO FROM CARROLL INLET AND
~	~	~	NORTH SADDLE LAKE
13	M	CDE	MEET MOD. VQO FROM CARROLL INLET
14-16	PR	ABCDE	MEET PAR. RET. VQO FROM NORTH HALF OF
~	~	~	N. SADDLE LAKE AND MOD. VQO FROM SOUTH
~	~	~	HALF OF LAKE.
~	~	~	~
28-34	M	ABCDE	MEET MOD. VQO FROM SALT LAGOON
~	~	~	~
27	PR	ACDE	MEET PAR. RET. VQO FROM SALT LAGOON
35-38	PR	ABCDEFGHIJK	MEET PAR. RET. FROM SALT LAGOON AND MIN.
~	~	~	LEVEL OF HARVEST IMMEDIATELY ALONG ROAD
~	~	~	TO MEET MOD. VQO FROM ROAD. DO NOT USE
~	~	~	NARROW BUFFER STRIPS. USE OTHER DESIG.
~	~	~	MIT. MEASURES TO MIN. IMPACT OF ROAD
~	~	~	CONSTRUCTION.
~	~	~	~
39-40	M	ACDE	MEET MOD. VQO FROM SALT LAGOON
~	~	~	~
42	M	ACDE	MEET MOD. FROM SALT LAGOON AND ROAD
~	~	~	~
41,43-48	M	ABCDEFGHIJK	MEET MOD. VQO FROM SALT LAGOON AND MIN.
~	~	~	LEVEL OF AHRVEST IMMEDIATELY ALONG ROAD
~	~	~	TO MEET MOD. VQO FROM ROAD-WITHOUT USING
~	~	~	NARROW BUFFER STRIPS. USE OTHER DESIG.
~	~	~	MIT. MEASURES TO MIN. IMPACT OF ROAD
~	~	~	CONSTRUCTION.
~	~	~	~
49-51	MM	CDE	USE MIT. MEAS. TO MINIMIZE IMPACT FROM
~	~	~	LEASK LAKE AND LEASK COVE.
~	~	~	~
20	MM		NO MITIGATION MEASURES
21-26	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
~	~	~	FROM SALT LAKE
~	~	~	~
N.SADDLE	~	~	~
LAKES RD	M	FGHIJK	USE THESE MIT. MEASURES TO MINIMIZE
~	~	~	VISUAL IMPACT IN THE IMMEDIATE FORE-
~	~	~	GROUND OF ROAD AND ITS CONSTRUCTION

ALTERNATIVE 3 - (continued)

UNIT	VQO	ACTION	SPECIAL DIRECTION
~	~	~	SPECIFIC AREAS SUCH AS ROAD SEGMENTS WITH SCENIC VIEWS, ACCESS POINTS OR TRAILHEADS TO SPECIFIC RECREATION ATTRACTIONS, SPECIFIC RECREATION SITES, OUTSTANDING STANDS OF OLD-GROWTH TIMBER SHOULD BE IDENTIFIED AS HIGHEST PRIORITY FOR SLASH REMOVAL.

ALTERNATIVE 4- VISUAL MITIGATION MEASURES

UNIT	VQO	ACTION	SPECIAL DIRECTION
1-4	M	CDE	MEET MOD. VQO FROM CARROLL INLET
5-7	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT FROM CARROLL INLET.
8-20	M	ABCDE	MEET MOD. VQO FROM CARROLL INLET
21,22,27	M	CDE	MEET MOD. VQO FROM CARROLL INLET
26,34	M	CDE	MEET MOD. VQO FROM CARROLL INLET, BUT MAX. MOD FROM NORTH SADDLE LAKE.
23-25	MM	ABCDE	USE MIT. MEAS. TO MEET MAX. MOD. VQO FROM CARROLL INLET.
36-38	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT FROM NORTH SADDLE LAKE.
35	M	CDE	MEET MOD. VQO FROM CARROLL INLET
42	MM	-	NO MITIGATION MEASURES
40-41	MM	-	NO MITIGATION MEASURES
39,43-47	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT FROM SALT LAGOON.
28-33,48	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT FROM SALT LAKE.
49-51	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
N.SADDLE LAKES RD	M	FGHIJK	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT OF ROAD AND ITS CONSTRUCTION SPECIFIC AREAS SUCH AS ROAD SEGMENTS WITH SCENIC VIEWS, ACCESS POINTS OR TRAILHEADS TO SPECIFIC RECREATION ATTRACTIONS, SPECIFIC RECREATION SITES, OUTSTANDING STANDS OF OLD-GROWTH TIMBER SHOULD BE IDENTIFIED AS HIGHEST PRIORITY FOR SLASH REMOVAL.

ALTERNATIVE 5- VISUAL MITIGATION MEASURES

UNIT	VQO	ACTION	SPECIAL DIRECTION
1-4	M	ABCDE	MEET MOD. VQO FROM CARROLL INLET
5-7	MM	-	NO MITIGATION MEASURES
8-13,48	M	ABCDE	MEET MOD. VQO FROM CARROLL INLET
35-46	M	CDE	MEET MOD. VQO FROM CARROLL INLET
47	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
	-	-	-
14-18	M	CDE	MEET MOD. VQO FROM CARROLL INLET
22	M	CDE	MEET MOD. VQO FROM CARROLL INLET
-	-	-	-
23-24	M	ABCDE	MEET MOD. VQO FROM SALT LAGOON
-	-	-	-
27	MM	-	NO MIT. MEASURES
25	PR	CDE	MEET PAR. RET. VQO FROM SALT LAGOON
28-34	PR	ACDE	MEET PAR. RET. VQO FROM SALT LAGOON
-	-	-	-
N.SADDLE	M	FGHIJK	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
LAKES RD	-	-	OF ROAD AND ITS CONSTRUCTION
-	-	-	SPECIFIC AREAS SUCH AS ROAD SEGMENTS
-	-	-	WITH SCENIC VIEWS, ACCESS POINTS OR
-	-	-	TRAILHEADS TO SPECIFIC RECREATION
-	-	-	ATTRACTIONS, SPECIFIC RECREATION SITES,
-	-	-	OUTSTANDING STANDS OF OLD-GROWTH TIMBER
-	-	-	SHOULD BE IDENTIFIED AS HIGHEST PRIORITY
-	-	-	FOR SLASH REMOVAL.

ALTERNATIVE 6- VISUAL MITIGATION MEASURES

UNIT	VQO	ACTION	SPECIAL DIRECTION
1-8,16	M	ABCDE	MEET MOD. VQO FROM SALT LAGOON
-	-	-	-
15	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
-	-	-	-
9-14	M	CDE	MEET MOD. VQO FROM CARROLL INLET
-	-	-	-
17-19	M	CDE	MEET MOD. VQO FROM CARROLL INLET
22-23	M	CDE	" " "
-	-	-	-
20-21	M	ACDE	MEET MOD. VQO FROM N. SADDLE LAKES
-	-	-	-
30-31	M	CDE	MEET MOD. VQO FROM SALT LAGOON
37	M	CDE	" " "
38	M	ACDE	" " "
40	M	CDE	" " "
41	M	CDE	" " "
-	-	-	-
39	MM	ACDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
	-	-	-
44	PR	ACDE	MEET PAR. RET. VQO FROM HECKMAN LAKE
-	-	-	-
42-43	M	ACDEFGHIJK	MEET MOD. FROM SALT LAGOON. USE MIT.
-	-	-	MEAS. TO MINIMIZE VISUAL IMPACT OF ROAD
-	-	-	
45-49	M	ACDEFGHIJK	MEET MOD. VQO FROM SALT LAGOON. USE MIT.
-	-	-	MEAS. TO MINIMIZE VISUAL IMPACT OF ROAD
-	-	-	AND LOCATE UNITS AND MAIN ROAD TO MIN.
-	-	-	LENGTH OF ROAD THROUGH HARVESTED GROUND
-	-	-	WITHOUT USING NARROW BUFFER STRIPS.
52-57	M	ACDEFGHIJK	" " "
-	-	-	-
50-51	PR	ABCDE	MEET NO LOWER THAN PARTIAL RETENTION
-	-	-	VQO FROM PATCHING LAKE
-	-	-	-
24-28	MM	CDE	USE MIT. MEAS. TO MINIMIZE VISUAL IMPACT
-	-	-	FROM SALT LAKE
29	-	-	NO MITIGATION MEASURES
-	-	-	-
32-36	PR	ACDE	MEET PAR. RET. VQO FROM SALT LAGOON
-	-	-	-
N.SADDLE	M	FGHIJK	USE THESE MIT. MEASURES TO MINIMIZE
LAKES RD	-	-	VISUAL IMPACT OF ROAD IN THE IMMEDI-
-	-	-	ATE FOREGROUND
-	-	-	SPECIFIC AREAS SUCH AS ROAD SEGMENTS
-	-	-	WITH SCENIC VIEWS, ACCESS POINTS OR
-	-	-	TRAILHEADS TO SPECIFIC RECREATION
-	-	-	ATTRACTIONS, SPECIFIC RECREATION SITES,
-	-	-	OUTSTANDING STANDS OF OLD-GROWTH TIMBER
-	-	-	SHOULD BE IDENTIFIED AS HIGHEST PRIORITY
-	-	-	FOR SLASH REMOVAL.

Recreation Mitigation Measures

The following actions will be applied to harvest units and associated road construction to meet recreation objectives. The letters in the "Action" column in the following tables identify the actions that apply to each unit:

A. Schedule harvest and roadbuilding activities to minimize impacts from noise.

B. Areas with potential recreation values and sites will be analyzed on the ground in advance of unit and road location. Roads, turnouts, rockpits, and unit boundaries will be designed to protect scenic values of identified recreation sites and provide, where appropriate, well designed access to recreation features.

C. Adjust unit boundaries near potential sportfishing areas on lakes and streams, including class one and two streams, to retain approximately 200 feet of windfirm timber on each side of the waterbody.

Unit Specific Recreation Mitigation Measures

ALTERNATIVE 2

UNIT	Action	Special Direction
746-1	B	
746-2	BC	
746-3	B	
746-4	B	
746-5	BC	
746-9	B	
746-10	B	
746-34	-	
746-44	C	
747-6	B	
747-7	B	
747-8	-	
747-11	B	
747-12	B	
747-13	-	
747-14	-	
747-15	ABC	Harvest during low recreation periods to maintain primitive setting of the Naha area.
747-16	ABC	" " "
747-17	ABC	" " "
747-18	AB	" " "
747-19	-	
747-20	-	
747-21	ABC	Harvest during low recreation periods to maintain primitive setting of the Naha area.
747-22	ABC	" " "
747-23	AB	" " "
747-24	AB	" " "
747-25	B	
747-26	-	
747-27	B	
747-28	-	
747-29	-	
747-35	B	
747-36	B	
747-37	BC	
747-38	B	
747-39	-	
747-40	-	
747-41	-	
747-42	-	
747-43	-	
748-30	-	
748-31	-	
748-32	-	
748-33	-	

ALTERNATIVE 3

UNIT	Action	Special Direction
746-1	B	
746-2	-	
746-3	B	
746-4	B	
746-5	-	
746-6	B	
746-7	B	
746-8	BC	
746-9	B	
746-10	B	
746-11	B	
746-12	B	
746-13	B	
746-14	B	
746-15	B	
746-16	B	
746-17	B	
746-18	B	
746-19	-	
747-20	-	
747-21	C	
747-22	B	
747-23	B	
747-24	BC	
747-25	-	
747-26	B	
747-27	B	
747-28	C	
747-29	B	
747-30	B	
747-31	B	
747-32	-	
747-33	C	
747-34	-	
747-35	BC	
747-36	B	
747-37	B	
747-38	-	
747-39	-	
747-40	-	
747-41	AB	Harvest during low recreation periods to maintain primitive setting of the Naha area.
747-42	AB	" " "
747-43	-	
747-44	-	
747-45	-	
747-46	-	
747-47	-	
747-48	-	
747-50	-	
748-49	-	
748-51	-	

ALTERNATIVE 4

UNIT	Action	Special Direction
746-1	B	
746-2	B	
746-3	B	
746-4	B	
746-5	B	
746-6	B	
746-7	B	
746-21	B	
746-22	B	
746-23	B	
746-24	B	
746-25	B	
746-26	B	
746-27	B	
746-34	B	
746-35	B	
746-36	B	
746-37	BC	
746-41	B	
746-42	B	
747-28	B	
747-29	BC	
747-30	C	
747-31	-	
747-32	-	
747-33	BC	
747-38	B	
747-39	B	
747-40	BC	
747-43	B	
747-44	B	
747-45	-	
747-46	-	
747-47	BC	
747-48	ABC	Harvest during the low recreation periods to maintain the primitive setting of the Naha area.
747-49	ABC	" " "
747-50	AB	" " "
747-51	-	
753-8	B	
753-9	-	
753-10	B	
753-11	B	
753-12	B	
753-13	B	
753-14	-	
753-15	-	
753-16	-	
753-17	B	
753-18	B	
753-19	B	
753-20	-	

ALTERNATIVE 5

UNIT	Action	Special Direction
746-1	B	
746-2	B	
746-3	B	
746-4	B	
746-5	BC	
746-6	B	
746-7	B	
746-8	B	
746-9	BC	
746-10	B	
746-11	B	
746-12	B	
746-13	B	
746-14	B	
746-15	B	
746-16	BC	
746-17	B	
746-18	-	
746-22	B	
746-26	BC	
746-27	B	
746-48	B	
747-19	-	
747-20	BC	
747-21	B	
747-23	-	
747-24	-	
747-25	B	
747-28	BC	
747-29	B	
747-30	-	
747-31	-	
747-32	-	
747-33	-	
747-34	C	
753-35	B	
753-36	-	
753-37	B	
753-38	B	
753-39	B	
753-40	-	
753-41	-	
753-42	-	
753-43	B	
753-44	B	
753-45	B	
753-46	B	
753-47	B	

ALTERNATIVE 6

UNIT	Action	Special Direction
746-1	B	
746-2	B	
746-3	B	
746-4	B	
746-5	B	
746-6	B	
746-7	B	
746-8	B	
746-16	B	
746-17	B	
746-18	B	
746-19	B	
746-20	B	
746-21	B	
346-22	BC	
746-23	B	
747-24	B	
747-25	B	
747-26	BC	
747-27	B	
747-28	-	
747-29	-	
747-30	B	
747-31	B	
747-32	B	
747-33	B	
747-34	-	
C17-35	-	
747-36	-	
747-37	B	
747-38	-	
747-39	B	
747-40	-	
747-41	B	
747-42	B	
747-43	ABC	Harvest during the low recreation periods to maintain the primitive setting of the Naha area.
747-44	AB	
747-45	ABC	" " "
747-46	ABC	" " "
747-47	ABC	" " "
747-48	-	
747-49	-	
747-50	ABC	" " "
747-51	BC	
747-52	B	
747-53	B	
747-54	B	
747-55	-	
747-56	-	
747-57	-	
748-58	-	
748-59	-	
753-9	-	
753-10	-	
753-11	B	
753-12	B	
753-13	B	
753-14	-	
753-15	B	

Fish Mitigation Measures

Unit Specific Fisheries Mitigation Measures

ALTERNATIVE # 2

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
746-1	C2	I	100' N.C.	Y	Y	Y
746-2	L	I	200' N.C.	Y	Y	Y
746-2	L1	I	100' N.C.	Y	Y	Y
746-3	NCS					
746-4	NCS					
746-5	L	I	200' N.C.			Y
746-9	L	I	200' N.C.	Y	Y	N
746-10	L	I	200' N.C.			Y
746-10	A6	I	100' N.C.			Y
746-10	B4	I	100' N.C.			Y
746-34	A2	II	100' N.C.	N	Y	Y
746-44	B4	I	N/A	Y	Y	N/A
	C7	I	N/A	Y	Y	N/A
747-6	NCS					
747-7	C2	I	100' N.C.	Y	Y	N
747-8	C1	I	200' N.C.			N
747-8	B4	I	100' N.C.			N
747-8	A4	III	split yard	N	N	N
747-11	NCS					
747-12	NCS					
747-13	NCS					
747-14	NCS					
747-15	C3	I	200' N.C.			N
747-16	L	I	200' N.C.			N
747-17	L	I	200' N.C.			N
747-17	C5	I	100' N.C.	Y	Y	N
747-18	A1	III	split yard	N	N	N
747-18	B2	I	100' N.C.			N
747-18	C3	I	200' N.C.	Y	Y	N
747-19	A4	III	split yard			N
747-20	NCS					
747-21	L	I	200' N.C.			N
747-22	L2	I	200' N.C.	Y	Y	N
747-23	B1	I	100' N.C.			N
747-24	B1	I	100' N.C.			N
747-25	NCS					
747-26	NCS					
747-27	NCS					
747-28	NCS					
747-29	A1	III	split yard	N	N	N
747-35	A1	III	split yard	N	N	N
747-35	A1	III	split yard	N	N	N
747-36	A1	III	split yard	N	N	N
747-36	A1	III	split yard	N	N	N
747-36	A1	III	split yard			N
747-37	A3	II	100' N.C.	Y	Y	N
747-37	A1	III	split yard			N
747-37	A7	II	100' N.C.	Y	Y	N
747-37	A1	III	split yard			N
747-38	NCS					
747-39	B3	I	100' N.C.	Y	Y	N
747-39	A2	II	100' N.C.			N
747-39	A1	III	split yard	N	Y	N
747-39	A1	III	split yard	N	Y	N
747-40	A2	II	100' N.C.	N	Y	N
747-41	NCS		road crossings	N	Y	
747-42	B2	II	100' N.C.			N
747-42	A1	III	split yard			N
747-43	B2	II	100' N.C.	Y	Y	N
748-30	NCS		stream crssing to unit	N	N	
748-31	NCS		stream crossing to unit	N	N	
748-32*	NCS					
748-33	A1	III	split yard			N

ALTERNATIVE #3

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
746-1	C2	I	100' N.C.	Y	Y	Y
746-2	C2	I	100' N.C.			Y
746-3	B6	I	100' N.C.	N	Y	N
746-3	B7	II	100' N.C.	Y	N	N
746-3	A2	II	100' N.C.	N	N	N
746-4	NCS					
746-5	NCS					
746-6	NCS					
746-7	NCS		stream crossing to unit	N	N	
746-8	L2	I	300' N.C.			Y
746-9	NCS					
746-10	NCS					
746-11	B1	I	100' N.C.	Y	Y	Y
746-12	L1	I	100' N.C.	Y	Y	Y
746-13	NCS					
746-14	NCS					
746-15	NCS					
746-16	A1	III	split yard			N
746-17	B6	II	100' N.C.			Y
746-17	A2	II	100'	Y	Y	
746-18	NCS					
746-19	A1	III	split yard	N	N	Y
747-20	NCS					
747-21	B4	III	split yard	N	N	N
747-22	A1	III	split yard	N	N	N
747-22	A1	III	split yard			N
747-22	A1	III	split yard			N
747-22	A1	III	split yard			N
747-23	A4	III	100' N.C.			N
747-24	A3	II	100' N.C.	N	Y	N
747-24	A1	III	split yard	N	Y	N 1/
747-24	A7	II	100' N.C.	N	Y	N
747-24	A1	III	split yard	N	Y	N
747-25	A1	III	split yard	N	Y	N
747-25	A2	II	100' N.C.			N
747-25	B3	I	100' N.C.	Y	Y	N
747-25	A1	III	split yard	N	Y	N
747-26	NCS					
747-27	C2	I	100' N.C.			N 2/
747-27	A1	III	split yard	N		N
747-28	C1	I	200' N.C.			N
747-28	B4	I	100' N.C.			N
747-28	A1	III	split yard	N	N	N
747-29*	NCS					
747-30	NCS					
747-31	B2	II	100' N.C.			N
747-31	A7	III	split yard	N	Y	N
747-32	C1	I	200' N.C.	Y	Y	N
747-32	B4	I	100' N.C.	Y	Y	N
747-33	B1	I	100' N.C.			N
747-34	B3	I	100' N.C.			N 3/

ALTERNATIVE 3 (continued)

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
747-34	B6	I	100' N.C.			N
747-35	C5	I	100' N.C.			N
747-35	A4	III	100' N.C.	N	Y	N
747-36	A2	II	100' N.C.	N	Y	N
747-37	NCS					
747-38	NCS					
747-39	A1	III	split yard	N	N	N
747-39	A1	III	split yard	N	N	N
747-39	A2	III	split yard	N	N	N
747-40	A7	III	split yard	N	N	N
747-41	B2	II	100' N.C.	Y	Y	N
747-41	A1	III	split yard	N	Y	N
747-42	L2	I	300' N.C.	Y	Y	N
747-42	A1	III	split yard	N	Y	N
747-42	C5	I	100' N.C.			N
747-43	A4	III	split yard			N
747-44	NCS					
747-45	NCS					
747-46	NCS					
747-47	NCS					
747-48	A1	III	split yard	N	N	N
748-49	A1	III	split yard	N	N	N
748-50	A1	III	split yard	N	N	N
748-51	NCS		no timing on A1 to unit			

* = unit split between VCU 746 & 747

1/ Road timing on crossings to unit.
2/ RCT on B4 on road crossing to unit.
3/ RCT required on B4 before unit.

ALTERNATIVE 4

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
746-1	C2	I	100' N.C.	Y	Y	Y
746-2	B6	I	100' N.C.	Y	Y	N
746-2	B5	I	100' N.C.	Y	Y	N
746-3	A2	II	100' N.C.	N	Y	N
746-3	B6	I	100' N.C.	Y	Y	N
746-3	B7	II	100' N.C.	Y	Y	N
746-4	L1	II	100' N.C.	Y	Y	N
746-4	A2	II	100' N.C.	N	Y	N
746-5	NCS					
746-6	A1	III	split yard	N	N	N
746-6	A1	III	split yard			N
746-7	B1	I	100' N.C.			N
746-7	A1	III	split yard	N	N	N
746-7	A1	III	split yard	N	N	N
746-7	A4	III	split yard	N	N	N
746-21	B1	I	100' N.C.	Y	Y	Y
746-21	C2	I	100' N.C.			Y
746-21	B4	I	100' N.C.			Y
746-22	B3	I	100' N.C.	Y	Y	N
746-22	B2	I	100' N.C.			N
746-23	A1	III	split yard	N	N	N
746-23	A1	III	split yard	N	N	N
746-23	A4	III	split yard	N	N	N
746-23	A1	III	split yard	N	N	N
746-23	A1	III	split yard	N	N	N
746-23	A1	III	split yard	N	N	N
746-23	A4	III	split yard	N	N	N
746-24	A2	III	split yard	N	N	N
746-24	A1	III	split yard	N	N	N
746-25	A2	II	100' N.C.	N	N	N
746-25	A2	II	100' N.C.	N	N	N
746-26	B6	I	100' N.C.			Y
746-26	B2	I	100' N.C.			Y
746-26	A7	I	100' N.C.	Y	Y	Y
746-26	B6	I	100' N.C.	Y	Y	Y
746-27	B6	I	100' N.C.			Y
746-27	A2	II	100' N.C.			Y
746-34	L1	I	100' N.C.	Y	Y	Y
746-34	L	I	200' N.C.	Y	Y	Y
746-35	NCS					
746-36	NCS					
746-37	L	I	200' N.C.	Y	Y	Y
746-37	A1	III	split yard	N	Y	Y
746-41	L	I	200' N.C.	Y	Y	Y
746-42	NCS					
747-28	A1	III	split yard	N	Y	N
747-28	A1	III	split yard	N	Y	N
747-28	A1	III	split yard	N	N	N
747-28	A1	III	split yard	N	N	N
747-29	A3	II	100' N.C.	Y	Y	N
747-29	A7	II	100' N.C.	N	Y	N

ALTERNATIVE 4 (continued)

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
747-29	A1	III	split yard			N
747-29	A1	III	split yard			N
747-30	A1	III	split yard			N
747-30	A1	III	split yard	N	Y	N
747-30	B3	I	100' N.C.	Y	Y	N
747-30	A2	II	100' N.C.			N
747-31	A2	II	100' N.C.			N
747-31	B2	II	100' N.C.	Y	Y	N
747-31	A1	III	split yard	N	N	N
747-32	NCS					
747-33	L	I	200' N.C.			N
747-33	A1	III	100' N.C.			N
747-38*	L	I	200' N.C.	Y	Y	Y
	B4 leading to unit needs fish passage and timing					
747-38*	A1	III	split yard	N	N	N
747-39	A1	III	split yard	N	N	N
747-39	C2	I	100' N.C.			N
747-39	A1	III	split yard			N
747-40	C1	I	200' N.C.	Y	Y	N
747-40	B4	I	100' N.C.	Y	Y	N
747-40	A4	III	split yard	N	N	N
747-40	A4	III	split yard			N
747-43	C5	I	100' N.C.		Y	N
747-43	A4	III	split yard	N	Y	N
747-43	A1	III	split yard	N	Y	N
747-44	NCS					
747-45	A1	III	split yard	N	N	N
747-45	A1	III	split yard	N	N	N
747-45	A2	III	split yard	N	N	N
747-46	A7	III	split yard	N	N	N
747-46	A2	III	split yard			N
747-47	C3	I	200' N.C.			N
747-47	C5	I	100' N.C.			N
747-48	L	I	200' N.C.	Y	Y	N
	B6 leading to unit needs passage and timing					
747-48	C5	I	100' N.C.	Y	Y	N
747-49	L2	I	300' N.C.	Y	Y	N
747-50	B2	I	100' N.C.			N
747-50	A1	III	split yard	N	Y	N
747-51	A1	III	split yard			N
753-8	B2	II	100' N.C.	Y	Y	N
	B4	II	Outside unit requires road fish passage.			
753-8	A7	II	100' N.C.	N	N	N
753-8	A1	III	split yard	N	N	N
753-9	B4	I	100' N.C.			N
753-10	B4	I	100' N.C.			N
753-10	B6	I	100' N.C.			N
753-11	B3	I	100' N.C.	Y	Y	N
753-11	B6	I	100' N.C.			N
753-12	NCS					
753-13	B1	I	100' N.C.	Y	Y	N
753-13	B4	I	100' N.C.			N
753-13	B2	I	100' N.C.	Y	Y	N
753-14	NCS					
753-15	B1	I	100' N.C.	Y	Y	N
753-15	B2	I	100' N.C.	Y	Y	N
753-16	B4	II	100' N.C.	Y	Y	N
753-16	A4	III	split yard			N
753-16	A1	III	split yard			N
753-17	B2	I	100' N.C.	Y	Y	N
753-17	L1	I	100' N.C.			N
753-18	NCS					
753-19	B1	I	100' N.C.			N
753-19	B2	I	100' N.C.	Y	Y	N
753-20	B2	I	100' N.C.	Y	Y	N
753-20	A2	II	100' N.C.	N	Y	N
753-20	A1	III	split yard			N

* = unit split between VCU 746 & 747

ALTERNATIVE 5

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
746-1	C2	I	100' N.C.	Y	Y	Y
746-2	A4	III	split yard	N	N	N
746-2		Passage and timing required for B4 crossing accessing unit.				
746-3	NCS	No passage or timing required for A4 crossing accessing unit.				
746-4	NCS					
746-5	L2	I	300' N.C.			Y
746-6	NCS	No passage or timing required for accessing unit.				
746-7	NCS					
746-8	B6	I	100' N.C.	Y	Y	N
746-8	B5	I	100' N.C.	Y	Y	N
746-9	A2	II	100' N.C.	N	Y	N
746-9	B7	II	100' N.C.	Y	Y	N
746-9	B6	I	100' N.C.	Y	Y	N
746-10	NCS					
746-11	NCS	Passage and timing required for L1 road crossing accessing unit.				
746-12	B7	II	100' N.C.			N
746-12	B6	I	100' N.C.			N
746-12	B1	I	100' N.C.			N
746-13	NCS					
746-14	C2	I	100' N.C.			Y
746-14	B4	I	100' N.C.			Y
746-15	B3	I	100' N.C.			Y
746-15	B2	I	100' N.C.			Y
746-15		Fish passage and timing required on B1 crossing accessing unit.				
746-16	A7	I	100' N.C.	Y	Y	Y
746-16	B2	I	100' N.C.			Y
		Fish passage and timing required on B1 crossing to access unit.				
746-17	B6	I	100' N.C.			Y
746-17	A2	II	100' N.C.	N	Y	Y
746-18	A1	I	split yard			Y
746-18	A2	II	100' N.C.			Y
746-22	NCS					
747-26	L	I	200' N.C.			Y
747-26		Fish passage and timing required on A6 crossing to access unit.				
746-27	L	I	200' N.C.			Y
746-27	A6	I	100' N.C.	Y	Y	Y
746-27	B4	I	100' N.C.			Y
746-47	B2	II	100' N.C.	Y	Y	N
746-47	A7	II	100' N.C.	Y	Y	N
746-47	A1	III	split yard	N	N	N
746-47		Fish passage and timing required on B4 crossing to access unit.				
746-48	NCS					
747-19	NCS					
747-20	L	I	200' N.C.			N
747-20	B4	III	100' N.C.	Y	N	N
747-21	A1	III	split yard	N	N	N
747-21	A1	III	split yard			N
747-21	A1	III	split yard			N
747-21		Timing required on large A1 accessing unit.				
747-23	A1	III	split yard	N	N	N
747-23	A1	III	split yard	N	N	N

ALTERNATIVE 5 (continued)

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
747-23		Fish passage and timing required on B4 accessing unit.				
747-24	A7	III	split yard	N	N	N
747-25	C2	I	100' N.C.			N
747-25	A1	III	split yard			N
747-25	A1	III	split yard			N
747-28	C1	I	200' N.C.			N
747-28	B4	I	100' N.C.			N
747-28	A4	III	split yard	N	N	N
747-29	B2	I	100' N.C.	Y	Y	N
747-29	A7	II	100' N.C.	Y	Y	N
747-30	B3	I	100' N.C.			N
747-30	B6	I	100' N.C.			N
747-31	C1	I	200' N.C.			N
747-31	B4	I	100' N.C.	Y	Y	N
747-32	L	I	200' N.C.			N
747-33	B1	I	100' N.C.			N
747-34	L2	I	200' N.C.			N
747-34	L	I	200' N.C.			N
747-34	B1	I	100' N.C.			N
753-35	B2	I	100' N.C.	Y	Y	N
753-35		Passage and timing required for A2 road crossing accessing unit.				
753-36	B2	I	100' N.C.	Y	Y	N
753-36	A2	II	100' N.C.	N	Y	N
753-37	NCS	Passage and timing required for B2 road crossing accessing unit.				
753-38	L1	I	100' N.C.			N
753-38	B2	I	100' N.C.	Y	Y	N
753-39	B1	I	100' N.C.	Y	Y	N
753-39	B4	I	100' N.C.			N
753-39	B2	I	100' N.C.			N
753-40	NCS					
753-41	B1	I	100' N.C.			N
753-41	B2	I	100' N.C.			N
753-42	A4	III	split yard			N
753-42	A7	II	100' N.C.	N	Y	N
753-43	NCS					
753-44	B6	I	100' N.C.			N
753-44	B3	I	100' N.C.	Y	Y	N
753-45	B4	I	100' N.C.			N
753-45	B6	I	100' N.C.			N
753-46	B4	I	100' N.C.			N

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* = unit split between VCU 746 & 747

ALTERNATIVE 6

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
746-1	C2	I	100' N.C.	Y	Y	Y
746-2	B6	I	100' N.C.	Y	Y	N
746-2	B5	I	100' N.C.	Y	Y	N
746-3	B6	I	100' N.C.	Y	Y	N
746-3	A2	II	100' N.C.			N
746-3	B7	II	100' N.C.			N
746-4	NCS					
746-5	L1	II	100' N.C.	Y	Y	N
746-5	A2	II	100' N.C.	N	Y	N
746-6	NCS					
746-7	B1	I	100' N.C.			N
746-7	B6	I	100' N.C.			N
746-7	B7	II	100' N.C.			N
746-8	NCS					
746-16	NCS	No passage or timing required to access unit.				
746-17	B4	I	100' N.C.			Y
746-17	C2	I	100' N.C.			Y
746-18	B3	I	100' N.C.	Y	Y	Y
	B1	Passage and timing required on stream accessing unit.				
746-18	B2	I	100' N.C.	Y	Y	Y
746-19	NCS	Passage and timing required on B1 and L1 crossings accessing units.				
746-20	NCS					
746-21	B4	I	100' N.C.	Y	Y	Y
746-22	B2	I	100' N.C.	Y	Y	Y
746-22		Passage and timing required on A7 stream crossing accessing unit.				
746-23	A2	II	100' N.C.			Y
746-23	B6	II	100' N.C.			Y
747-24	A4	III	split yard			N
747-25	A1	III	100' N.C.	N	Y	N
747-25	A1	III	100' N.C.	N	Y	N
747-25	A1	III	split yard			N
747-25	A1	III	split yard			N
747-26	A3	II	100' N.C.	Y	Y	N
747-26	A7	II	100' N.C.	N	Y	N
747-26	A1	III	split yard			N
747-26	A1	III	split yard			N
747-27	NCS	Passage required on B3 crossing accessing unit.				
747-28	B3	I	100' N.C.			N
747-28	A2	II	100' N.C.			N
747-28	A1	III	split yard	N	Y	N
747-28	A1	III	split yard	N	Y	N
747-29	B2	I	100' N.C.			N
747-29	A1	III	split yard	N	N	N
747-29	A1	III	split yard	N	N	N
747-30	NCS	Passage and timing required on B4 crossing accessing unit.				
747-31	C2	I	100' N.C.			N
747-31	A1	III	100' N.C.			N
747-31	A1	III	100' N.C.			N
747-32	C1	I	200' N.C.			N
747-32	B4	I	100' N.C.			N
747-32	A4	III	split yard		N	N

ALTERNATIVE 6 (continued)

UNIT	Channel Type	AHMU Class	Riparian Rx	Fish Passage	Road Timing	Temperature Sensitive
747-32	A4	III	split yard			N
747-33	B2	I	100' N.C.			N
747-33	A7	II	100' N.C.	Y	Y	N
747-34	B3	I	100' N.C.			N
747-34	B6	I	100' N.C.			N
747-35	C2	I	200' N.C.			N
		Passage and timing required for B4 crossing accessing unit.				
747-35	B4	I	100' N.C.			N
747-36	B1	I	100' N.C.			N
747-37	NCS					
747-38	A1	III	split yard	N	N	N
747-38	A1	III	split yard	N	N	N
747-39	A1	III	split yard			N
747-40	A7	III	split yard	N	N	N
747-41	C5	I	100' N.C.	Y	Y	N
747-41	A4	III	split yard	N	Y	N
747-42	C5	I	100' N.C.			N
747-43	C3	I	200' N.C.			N
747-44	NCS					
747-45	L2	I	300' N.C.	Y	Y	N
747-46	L2	I	300' N.C.			N
747-47	A1	III	split yard	N	Y	N
747-47	B2	I	100' N.C.	Y	Y	N
747-47	C3	I	200' N.C.			N
747-48	A4	III	split yard			N
747-49	NCS					
747-50	NCS					
747-51	L	I	200' N.C.			N
747-51	A4	III	split yard			N
747-52	NCS					
747-53	A4	III	split yard	N	N	N
747-54	NCS	No timing required on A1 crossing.				
747-55	NCS					
747-56	A1	III	split yard	N	N	N
747-57	A1	III	split yard	N	N	N
748-58	A1	III	split yard			N
748-59	NCS	No timing or passage required on A1 crossing accessing unit.				
753-9	A2	II	100' N.C.			N
753-9	B2	I	100' N.C.			N
753-9	B1	I	100' N.C.			N
753-9		Passage and timing required for A2 crossing accessing unit.				
753-10	NCS					
753-11	NCS					
753-12	B4	I	100' N.C.	Y	Y	N
753-13	NCS					
753-14	NCS	Passage and timing required for B3 road crossing accessing unit.				
753-15*	A1	III	split yard	N	N	N
753-15*	B2	II	100' N.C.	Y	N	N
753-15*	B4	II	100' N.C.	Y	N	N
753-15*	A1	III	split yard	N	N	N
753-15*	A7	II	100' N.C.	Y	N	N
753-15*	B2	II	100' N.C.			N

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* = unit split between VCU 753 & 746

Wildlife Mitigation Measures

These Mitigation Measures reflect objectives as stated in Standards and Guidelines and Mitigation Measures, Chapter 2, Wildlife and summarized in the following paragraphs.

1. Improve second-growth habitat by: (a) increasing forage production levels associated with early stages of succession; and (b) providing for habitat diversity.
2. Maintain nesting, denning, perching, and hiding cover for riparian wildlife; provide areas of existing forage throughout rotation.
3. Increase forage production.
4. Provide and/or maintain protection of existing nesting trees in known eagle habitat where timber harvest is occurring.
5. Provide for ecological requirements of cavity and snag dependent MIS species.
6. Design an access management plan if the Shelter Cove roads are ever connected to the greater Ketchikan system.
7. Provide microdiversity within harvested areas.
8. Reduce windthrow potential in association with identified old growth (increasing diversity by feathering which increases the edge).

ALTERNATIVE # 2

UNIT	1	2	3	4	5	6	7	8
746-1	X	X	X		X	X		
746-2		X	X		X	X		
746-3	X		X		X	X		
746-4		X	X		X	X		
746-5		X	X		X	X		
746-9		X	X		X	X		
746-10		X	X		X	X		
746-34	X	X	X		X	X		
746-44			X		X	X		
747-6			X		X	X		
747-7		X	X		X	X		
747-8		X	X		X	X		
747-11			X		X	X		
747-12	X		X		X	X		
747-13			X		X	X		
747-14		X	X		X	X		
747-15		X	X		X	X		
747-16		X	X		X	X		
747-17	X	X	X		X	X		
747-18		X	X		X	X		
747-19			X		X	X		
747-20			X		X	X		
747-21		X			X	X		
747-22		X	X		X	X		
747-23	X	X	X		X	X		
747-24		X	X		X	X		
747-25	X				X	X		
747-26	X		X		X	X		
747-27.			X		X	X		
747-28	X		X		X	X		
747-29	X		X		X	X		
747-35			X		X	X		
747-36			X		X	X		
747-37	X	X	X		X	X		
747-38	X		X		X	X		
747-39	X	X			X	X		
747-40			X		X	X		
747-41			X		X	X		
747-42			X		X	X		
747-43			X		X	X		
748-30	X		X		X	X		
748-31	X		X		X	X		
748-32	X				X	X		
748-33	X		X		X	X		

ALTERNATIVE #3

UNIT	1	2	3	4	5	6	7	8
746-1		X	X	X	X	X		
746-2		X	X		X	X		
746-3	X	X	X		X	X		
746-4			X		X	X		
746-5			X		X	X		
746-6			X		X	X		
746-7			X		X	X		
746-8		X	X		X	X		
746-9	X		X		X	X		
746-10					X	X		
746-11	X	X	X		X	X		
746-12		X	X		X	X		
746-13	X		X		X	X		
746-14		X	X		X	X		
746-15		X	X		X	X		
746-16		X	X		X	X		
746-17	X	X			X	X		
746-18	X		X		X	X		
746-19	X		X		X	X		
747-20			X		X	X		
747-21	X	X	X		X	X		
747-22					X	X		
747-23			X		X	X		
747-24	X	X	X		X	X		
747-25	X	X			X	X		
747-26	X	X	X		X	X		
747-27		X	X		X	X		
747-28		X	X		X	X		
747-29*	X		X		X	X		
747-30	X				X	X		
747-31		X	X		X	X		
747-32		X			X	X		
747-33		X	X		X	X		
747-34		X	X		X	X		
747-35	X	X	X		X	X		
747-36	X				X	X		
747-37	X		X		X	X		
747-38			X		X	X		
747-39			X		X	X		
747-40		X	X		X	X		
747-41		X	X		X	X		
747-42		X	X		X	X		
747-43	X		X		X	X		
747-44			X		X	X		
747-45			X		X	X		
747-46	X		X		X	X		
747-47	X		X		X	X		
747-48	X		X		X	X		
747-50	X		X		X	X		
748-49	X		X		X	X		
748-51	X		X		X	X		

* = unit split between VCU 746 & 747

ALTERNATIVE # 4

UNIT	1	2	3	4	5	6	7	8
746-1		X	X	X	X	X		
746-2	X	X			X	X		
746-3	X	X	X		X	X		
746-4		X	X		X	X		
746-5			X		X	X		
746-6	X		X		X	X		
746-7			X		X	X		
746-21	X	X	X		X	X		
746-22	X	X	X		X	X		
746-23	X		X		X	X		
746-24	X		X	X	X	X		
746-25	X		X	X	X	X		
746-26		X	X		X	X		
746-27		X	X		X	X		
746-34		X	X		X	X		
746-35	X		X		X	X		
746-36		X	X		X	X		
746-37		X	X		X	X		
746-41		X	X		X	X		
746-42			X		X	X		
747-28			X		X	X		
747-29	X	X	X		X	X		
747-30	X	X			X	X		
747-31			X		X	X		
747-32	X	X	X		X	X		
747-33	X		X		X	X		
747-38*		X	X		X	X		
747-39		X	X		X	X		
747-40		X	X		X	X		
747-43	X	X	X		X	X		
747-44	X		X		X	X		X
747-45			X		X	X		
747-46		X	X		X	X		
747-47		X	X		X	X		
747-48	X	X	X		X	X		
747-49		X	X		X	X		
747-50		X	X		X	X		
747-51	X		X		X	X		X
753-8	X		X		X	X		
753-9		X	X		X	X		
753-10	X	X	X		X	X		
753-11	X	X	X		X	X		
753-12	X		X		X	X		
753-13		X	X		X	X		
753-14			X		X	X		
753-15	X	X	X		X	X		
753-16			X		X	X		
753-17	X	X	X		X	X		
753-18	X		X		X	X		
753-19	X	X	X		X	X		
753-20	X	X	X		X	X		

* = unit split between VCU 746 & 747

ALTERNATIVE # 5

UNIT	1	2	3	4	5	6	7	8
746-1		X	X		X	X		
746-2			X		X	X		
746-3			X		X	X		
746-4			X		X	X		
746-5		X	X		X	X		
746-6	X				X	X		
746-7					X	X		
746-8	X	X			X	X		
746-9	X	X	X		X	X		
746-10			X		X	X		
746-11			X		X	X		
746-12		X	X		X	X		
746-13			X		X	X		
746-14	X	X	X		X	X		
746-15	X	X	X		X	X		
746-16		X	X		X	X		
746-17		X	X		X	X		
746-18	X		X		X	X		
746-22			X		X	X		
746-26		X	X		X	X		
746-27		X	X		X	X	X	
746-47*	X		X		X	X		
746-48			X		X	X		
747-19			X		X	X		
747-20	X	X	X		X	X		
747-21					X	X		
747-23			X		X	X		
747-24		X	X		X	X		
747-25		X	X		X	X		
747-28		X	X		X	X		
747-29		X	X		X	X		
747-30		X	X		X	X		
747-31		X			X	X		
747-32	X	X	X		X	X		
747-33		X	X		X	X		
747-34		X	X		X	X		
753-35	X	X	X		X	X		
753-36	X	X	X		X	X		
753-37	X		X		X	X		
753-38	X	X	X		X	X		
753-39		X	X		X	X		
753-40			X		X	X		
753-41	X	X	X		X	X		
753-42			X		X	X		
753-43	X		X		X	X		
753-44	X	X	X		X	X		
753-45	X	X	X		X	X		
753-46		X	X		X	X		

* = unit split between VCU 746 & 753

ALTERNATIVE # 6

UNIT	1	2	3	4	5	6	7	8
746-1		X	X		X	X		
746-2	X	X			X	X		
746-3	X	X	X		X	X		
746-4			X		X	X		
746-5		X	X		X	X		
746-6			X		X	X		
746-7		X	X		X	X		
746-8			X		X	X		
746-16			X		X	X		
746-17	X	X	X		X	X		
746-18	X	X	X		X	X		
746-19			X		X	X		
746-20		X	X		X	X		
746-21		X	X		X	X		
746-22	X		X		X	X		
746-23		X	X		X	X		
747-24			X		X	X		
747-25			X		X	X		
747-26	X	X	X		X	X		
747-27	X	X	X		X	X		
747-28	X	X			X	X		
747-29			X		X	X		
747-30			X		X	X		
747-31		X	X		X	X		
747-32		X	X		X	X		
747-33		X	X		X	X		
747-34		X	X		X	X		
747-35		X			X	X		
747-36		X	X		X	X		
747-37	X		X		X	X		
747-38			X		X	X		
747-39	X		X		X	X		
747-40		X	X		X	X		
747-41	X	X	X		X	X		
747-42					X	X		
747-43			X		X	X		
747-44			X		X	X		
747-45		X	X		X	X		
747-46		X	X		X	X		
747-47		X	X		X	X		
747-48			X		X	X		
747-49	X		X		X	X		
747-50			X		X	X		
747-51			X		X	X		
747-52	X		X		X	X		
747-53	X		X		X	X		
747-54	X				X	X		
747-55	X		X		X	X		
747-56	X		X		X	X		
747-57			X		X	X		
748-58	X		X		X	X		
748-59	X		X		X	X		

ALTERNATIVE 6 (continued)

UNIT	1	2	3	4	5	6	7	8
753-9	X	X	X		X	X		X
753-10			X		X	X		
753-11	X		X		X	X		
753-12		X	X		X	X		
753-13	X		X		X	X		
753-14	X		X		X	X		
753-15*	X		X		X	X	X	

* = unit split between VCU 753 & 746

Appendix C

Transportation

Appendix C

Transportation Facilities

Traffic Service Levels

The U.S. Forest Service operates an extensive road system throughout the United States. The agency developed a concept describing significant traffic characteristics and operating conditions. These are ''traffic service levels'' and are used in setting maintenance levels throughout the National Forest System. The following table displays the Traffic Service Levels.

	A	B	C	D
FLOW	Free flowing with adequate passing facilities.	Congested during heavy traffic such as during peak logging or recreation activities.	Interrupted by limited passing facilities or slowed by the road condition.	Flow is slow or may be blocked by an activity. Two-way traffic is difficult and may require backing to.
VOLUMES	Uncontrolled: will accommodate the expected traffic volumes.	Occasionally controlled during heavy use periods.	Eragtic: frequently controlled as the capacity is reached.	Intermittent and usually controlled. Volume is limited to that associated with the single purpose.
VEHICLE TYPES	Mixed: includes the critical vehicle and all vehicles normally found on public roads.	Mixed: includes the critical vehicle and all vehicles normally found on public roads.	Controlled mix: accommodates all vehicle types including the critical vehicle. Some use may controlled to minimize conflicts between behicle types.	Single Us: not designed for mixed traffic. Some vehicles may not be able to negotiate. Concurrent uses between commercial and other traffic is restricted.
CRITICAL VEHICLE	Clearances are adequate to allow free travel. Overload permits are required.	Traffic controls needed where clearances are marginal. Overload permits are required.	Special provisions may needed. Some vehicles will have difficulty negotiating some segments.	Some vehicles may not be able to negotiate. Loads may have to be toff-loaded and walked in.
SAFETY	Safety features are a part of the design.	High priority in design. Some protection is accomplished by traffic management.	Most protection is provided by traffic management.	The need for protection is minimized by low tspeeds and strict traffic controls.
MANAGEMENT TRAFFIC	Normally limited to regulatory, warning, and guide signs and permits.	Employed to reduce traffic volume and conflicts.	Traffic controls are frequently needed during periods of high use by the dominant resource activity.	Used to discourage or prohibit traffic other than that associated with the single purpose.
USER COSTS	Minimize: transportation efficiency is important.	Generally higher than "A" because of slower speeds and increased delays.	Not important: efficiency of travel may be traded for lower construction costs.	Not considered.
ALIGNMENT	Design speed is the predominant factor within feasible topographic limitations.	Influenced more strongly by topography than by speed and efficiency.	Generally dictated by topographic features and environmental factors. Design speeds are generally low.	Dictated by topography environmental factors, and the design and critical vehicle limitations. Speed is not important.
ROAD SURFACE	Stable and smooth with little or not dust, considering the normal season of use.	Stable for the predominant traffic for the normal use season. Periodic dust control for heavy use or environmental reasons. Smoothness is commensurate with the design speed.	May not be stable under all traffic or weather conditions during the normal use season. Surface rutting, roughness, and dust may be present, but controlled for environmental or investment protections	Rough and irregular. Travel with low clearance vehicles is difficult. Stable during dry conditions. Rutting and dusting controlled only for soil and water protection.

Coordination of Construction with Fish and Wildlife

Eagle Disturbance Zones

The following tables display areas of potential conflict between road construction and eagle disturbance. These areas are displayed by VCU and road segment. Concurrent fish timing situations are also displayed.

Eagle nest tree sites were obtained from the Eagle Atlas that is maintained by the Ketchikan Supervisor's Office, Tongass National Forest, Ketchikan, Alaska.

Eagle Disturbance Zones and Associated Road Segments

Alternative 1
(No Action Alternative)

Alternative 2
(No Road Construction Within 330′ Radius Zone)

Alternative 3
(No Road Construction Within 330′ Radius Zone)

Alternative 4

VCU[1]	Road Construction Within 330′ Radius Zone	Road Segment *From*	Road Segment *To*	Concurrent Fish and Eagle Timing
746	400 Ft.	746–22	746–24	No

[1] Only VCUs with known eagle trees near new construction are included in this table.

Alternative 5
(No Road Construction Within 330′ Radius Zone)

Alternative 6
(No Road Construction Within 330′ Radius Zone)

The following tables display identified AHMU stream crossings by VCU for each alternative.

Identified AHMU Stream Crossings
by VCU

Alternative 2

VCU	I	II	III	Total
742	0	0	1	1
746	8	0	0	8
747	4	4	28	36
748	0	0	0	0
753	0	0	0	0
Totals	12	4	29	45

Alternative 3

VCU	I	II	III	Total
742	0	0	1	1
746	6	1	4	11
747	4	3	19	26
748	0	0	0	0
753	0	0	0	0
Totals	10	4	24	38

Alternative 4

VCU	I	II	III	Total
742	0	0	0	0
746	10	6	19	35
747	4	4	21	29
748	0	0	0	0
753	6	5	0	11
Totals	20	15	40	75

Alternative 5

VCU	I	II	III	Total
742	0	0	0	0
746	10	3	4	17
747	1	2	7	10
748	0	0	0	0
753	6	3	3	12
Totals	17	8	14	39

Alternative 6

VCU	I	II	III	Total
742	0	0	1	1
746	8	4	2	14
747	5	2	31	38
748	0	0	0	0
753	2	1	3	6
Totals	15	7	37	59

Log Transfer Site Evaluation

The new log transfer site was selected and evaluated with respect to the interagency Log Transfer Siting Guidelines. Following is the evaluation of Shelter Cove proposed LTF in accordance with the interagency siting guidelines.

SITE NAME: Shelter Cove TLMP VCU NO: 746

CORPS OF ENGINEERS PERMIT ID:

SITE STATUS: Proposed

GUIDELINE ID	ATTF GUIDELINES	EVALUATION OF SITE AGAINST GUIDELINES
S1	Proximity to Rearing and Spawning Areas: Siting of log transfer and log raft storage facilities within 300 feet of the mouths of anadromous fish streams, or in areas known to be important for fish spawning or rearing, is normally prohibited.	Meets this guideline.
S2	Protected Locations: Log transfer and log raft storage facilities should be sited in weather protected waters with bottoms suitable for anchoring and with at least 20 acres for temporary log storage and log booming.	Ample rafting area. Bottom has good anchoring characteristics.
S3	Upland Facility Requirements: Log Transfer Facilities (LTF) generally should be sited in proximity to at least 5 acres of relatively flat uplands. There should also be a body of water sufficient to provide a minimum of 60 lineal foot facility face.	Site is relatively flat. Sufficient facility face.
S4	Safe Access To A Facility From The uplands: To provide safe access to the LTF adjoining log sort yard, the facility should be sited where access roads to the facility can maintain a grade of 10 percent or less for trucks and 4 percent for specialized equipment.	Meets this guideline.
S5	Bark Dispersal: LTFs should be sited along or adjacent to straits and channels or deep bays where currents may be strong enough to disperse sunken or floating wood debris. Siting LTFs in embayments with sills or other natural restrictions to tidal exchange should be avoided.	Site has good dispersal characteristics. Channel adjacent to site has good tidal current. Shore has steep slopes.

GUIDELINE ID	ATTF GUIDELINES	EVALUATION OF SITE AGAINST GUIDELINES
S6	<u>Site Productivity</u>: Sites for in-water storage and/or transfer of logs should be located in areas having the least productive intertidal and subtidal zone.	Estimated ranges of impact: Low is 1; High is 10 5
S7	<u>Sensitive Habitats</u>: LTFs and log raft storage areas hould not be sited on or adjacent to (i.e., near enough to effect) extensive tideflats, salt marches, kelp or eelgrass beds, seaweed harvest areas, or shellfish concentration areas.	Estimated ranges of impact: Log is 1; High is 10 2
S8	<u>Safe Marine Access to Facilities</u>: Log rafting and storage facilities should be safely accessible to tug boats with log rafts at most tides and on most winter days	True of this site.
S9	<u>Storage and Rafting</u>: Logs, log bundles, or log rafts should be stored in areas where they will not ground at low tide. A minimum depth of 40 feet or deeper measured at Mean Lower Low Water (MLLW) for log raft storage is preferred.	Ample water depth.
S10	<u>Avoid Bald Eagle Nest Trees</u>: Site LTFs to avoid bald eagle nests. No project construction or operations should be closer than 330 feet to any bald eagle nest tree.	No nest trees.

GUIDELINE ID	ATTF GUIDELINES	EVALUATION OF SITE AGAINST GUIDELINES
C1	LTF Design: LTF design should be the least environmentally damaging, practicable alternative. Factors to be considered in selection of design alternatives include: 1) economic practicality; 2) facility requirements; 3) physical site constraints; 4) timber volumes to be transferred (site usage and duration); 5) total potential effects on biota and water quality (including biological productivity and sensitivity); and 6) other potential uses of the site and facility.	Site is suitable for an A-frame lift-off system.
C2	Fill Structures: Fill structures shall be designed and constructed to prevent erosion, pollution, and structural displacement.	
C3	Timing of In-water Construction: In-water construction, blasting, and/or filling associated with LTF sites should be timed to limit adverse impacts to marine and estuarine fishery resources and avoid conflicts with other user groups.	
C4	Bark Accumulation Management: The siting, design, and operation of the LTF and contiguous collateral upland facilities shall utilize best practicable procedures and methodologies to control intertidal and sumbarine accumulations of bark.	
C5	Solid Waste Management: Solid waste including wood and other solid waste generated from the LTF, contiguous and other collateral facilities shall be routinely removed from the LTFs and adjacent facilities and disposed of at an spproved upland solid waste disposal site.	

GUIDELINE ID	ATTF GUIDELINES	EVALUATION OF SITE AGAINST GUIDELINES
C6	Bark Accumulation: The regulatory agency(ies) will impose an interim intertidal and submarine threshold bark accumulation level. When accumulations exceed the threshold level, cleanup--if any--will occur at the discretion of the permitting agency(ies). Tle interim threshold bark accumulation level is described as 100 percent coverage exceeding both 1 acre in size and a thickness greater than 10 cm (3.0 inches) at any point.	
C7	Bundle Speed: The speed of log bundles entering receiving waters should be the slowest practicable speed achievable. Decisions on the allowable transfer system that can be used will occur on a site-specific basis during the permitting process.	Entry velocity will be controlled by the operator and equipment.
C8	Surface Drainage Managment: The design, construction, and operation of LTFs, contiguous sort yards, and/or log storage yards shall utilize practicable procedures for control of surface water runoff from facilities.	
C9	Control of Hydrocarbons: The log transfer system and adjacent sort yard handling equipment shall be operated and maintained to minimize petroleum and lubricating products from entering waters.	
C10	On-shore Log Storage: Where feasible, preference must be given to on-shore storage and barging of logs.	
C11	Facility Maintenance and Reclamation: The permittee shall maintain the structure or work authorized in good condition and in reasonable accordance with the approved plans and drawings. If and when the permittee desires to abandon the authorized activity herein, unless such abandonment is part of a transfer procedure by which the permittee is transferring its interests to a third party, the permittee must restore the area to a satisfactory condition.	

Monitoring and Reporting Guidelines

The following are Monitoring and Reporting Guidelines contained in the Interagency LTF Siting Guidelines. These are generally applied during the tideland and navigable waters permitting process just prior to the design phase of these facilities.

M1 ***Monitoring by Permittee:*** Monitoring for bark accumulations, oil sheen, and surface runoff associated with the operation of LTFs is the responsibility of the permittee. The regulatory agencies may, at their discretion, be responsible for some or all monitoring requirements.

M2 ***Monitoring Requirements:*** Monitoring should be undertaken at all continuous and intermittent use LTF sites and at those occasional and incidental use LTFs at which total volume of logs transferred is similar to that of intermittent use sites. The level of monitoring and parameters to be monitored should be determined on a site-specific basis. Monitoring at occasional and incidental use facilities may be required on a site-specific basis. The need for monitoring of occasional or incidental use sites will be limited. Permittees will be required to submit a monitoring program to the permitting agencies prior to operation of a new continuous or intermittent use LTF. Agency approval of monitoring plans is required. Requirements for monitoring should be responsive to data obtained during prior monitoring activities.

M3 ***Annual Monitoring for Bark Accumulation:*** At continuous and intermittent use LTFs, monitoring of bark debris accumulation should occur prior to the operating season as a minimum requirement. Monitoring at intermittent LTFs would occur only during those periods when the LTF is active.

M4 ***Elements of Bark Accumulation Monitoring Program:*** Elements that should be included in a monitoring program for continuous and intermittent use LTFs, are site-specific and may include, but not be limited to: a) permanent transects; b) measurements if areal extent, thickness, and percent coverage of bark debris; and c) measurements required by MA, a and b are from MHW to depths of 60 feet MLLW.

M5 ***Monitoring for Oil Sheen:*** Waters in the vicinity of an LTF shall be monitored during operations for the presence of a visible sheen and recorded, when observed.

M6 ***Monitoring Upland Discharges:*** On a case-by-case basis, discharges of rainfall runoff from the log sorting and storage yard and discharges from any settling pond used to treat water may require monitoring to ensure compliance with State Winter Quality Standards and the Clean Water Act.

M7 ***Reporting Guidelines:*** Routine annual reports include the following description information: a) location of LTF (402/404 permits require latitude and longitude; Forest Service traditionally uses legal descriptions); b) description of LTF including transfer devices and sorting and storage areas; c) permit holder and/or operator of LTF; d) starting and ending dates of operating season (from first to last bundle, and number of operating days per season); e) gross volume in board feet (Scribner Scale) or number of bundles transferred during the operating season; and f) monitoring data described in Monitoring Guidelines.